

**COLORADO OFFICE OF THE STATE AUDITOR**

**COLORADO PUBLIC EMPLOYEES' RETIREMENT ASSOCIATION HYBRID  
DEFINED BENEFIT PLAN**

**A COMPREHENSIVE STUDY COMPARING THE COST AND EFFECTIVENESS  
TO ALTERNATIVE PLAN DESIGNS AUTHORIZED BY SENATE BILL 14 - 214**

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## **TRANSMITTAL LETTER**

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June 25, 2015

Members of the Legislative Audit Committee:

This report contains the results of a study of the Colorado Public Employees' Retirement Association's (PERA) Hybrid Defined Benefit Plan. The study was conducted pursuant to Section 24-51-614, C.R.S., which requires the State Auditor, with the concurrence of PERA, to retain a nationally recognized and enrolled actuarial firm with experience in public sector pension plans to perform a comprehensive study. The purpose of the study is to compare the cost and effectiveness of the PERA Hybrid Defined Benefit Plan design to alternative plan designs in the public and private sector. The report presents our findings and conclusions.

The work presented herein is based on data furnished by PERA and through research performed by our own staff. We gratefully acknowledge the cooperation of the Office of the State Auditor (OSA) and PERA, without whose assistance this project could not have been completed.

The work presented in this study relies on the actuarial work conducted by PERA's actuaries, and is based on the actuarial assumptions approved by the PERA Board of Trustees. As with any actuarial study which engages in the prediction of future outcomes, to the extent future experience differs from the assumptions, then the actuarial outcomes will similarly differ.

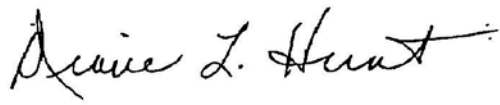
The actuaries submitting this statement are members of the American Academy of Actuaries and meet all of the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. In addition, the undersigned are experienced in performing actuarial valuations for other large public retirement systems.

Respectfully submitted,

**Gabriel, Roeder, Smith & Company**



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## **SECTION I**

### EXECUTIVE SUMMARY

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## SECTION I

### EXECUTIVE SUMMARY

- ✓ Retirement income as a percent of final income, or replacement ratio, is a common metric used to compare one retirement plan to another. Target adequacy replacement ratios range from 77% to 85% of pre-retirement final pay. (Section IV)
- ✓ The PERA Hybrid Plan, as a sole source of retirement income (i.e., because PERA does not participate in Social Security), has replacement ratios that fall short of target ranges, with one exception. PERA Hybrid Plan members who are hired at age 25 and spend their entire career at PERA may have benefits that reach adequacy targets. (Section IV)
- ✓ Alternative plans implemented for new hires require greater contributions in order to replace the same retirement income than the current PERA Hybrid Plan. If contributions are kept the same, alternative plans will provide a lower retirement benefit/replacement ratio. Alternative plans studied included defined contribution, cash balance, a combination of defined benefit and defined contribution, plus Social Security private sector model plans. (Section V)
- ✓ In 2010, PERA amended benefits, and the PERA Hybrid Plan's costs were reduced for members hired on or after January 1, 2011. PERA's costs for new hires (future hires) are lower than under any alternative plan. (Section V)
- ✓ Private sector plans with defined contribution components provide greater portable benefits than the PERA Hybrid Plan for members who terminate and wish to withdraw their funds prior to retirement; however, these plans do not have the comparable PERA feature of allowing members to keep their money in the plan until retirement and receive the additional employer match. (Section VI)
- ✓ Within its peer group of other non-Social Security states, the PERA Hybrid Plan provides a replacement ratio comparable to other statewide plans. Post-retirement cost of living adjustments (COLAs) are automatic for most of the peer group, while the PERA Hybrid Plan provides COLAs to new hires only to the extent affordable. (Section VI)
- ✓ The funded ratio is an illustration of the extent to which earned benefits are funded. A low funded ratio is an indicator of the need to increase assets and/or decrease liabilities. The PERA Hybrid Plan's funded ratio, on an aggregate basis for all divisions, is 61%, which is below the national average of 71.8% for all of the public sector plans in the Public Fund Survey. (Section VI)
- ✓ PERA's employee contributions on the whole are lower than the 10% average for peer group members. Comparatively, PERA members contribute 8% of pay (with some exceptions). PERA's employer contributions are equal to the average of the peer group, with significant variation between peers due to the length of the amortization period. (Section VI)
- ✓ Transition costs for moving new hires to an alternative plan would emerge in three main pieces: (1) the acceleration of the payoff of the unfunded accrued liability, (2) the higher cost of the new plan, and (3) the changing risk profile and investment earnings of the trust. (Section VII)

This in-depth look at the PERA Hybrid Defined Benefit Plan (PERA Hybrid Plan) illustrates that PERA is within norms for benefits when compared to its non-Social Security state peer group members. PERA benefits are also comparable to the private sector.

PERA is considered a hybrid plan, containing the plan design features of both a defined benefit plan and a defined contribution plan. Retiring members receive an annuity for life; terminating members may receive an account balance comprised of an employer "match" as well as guaranteed investment earnings.

This study found that the current PERA Hybrid Plan is more efficient and uses dollars more effectively than the other types of plans in use today.

Thus, costs may not be the greatest consideration either for or against a change in the Plan. The decision to change from the PERA Hybrid Plan to another type of plan would be due to a change in the State's compensation policy, not because the same benefits could be achieved at a lower cost.

Social Security is less efficient than other defined benefit plans. This is because all Social Security contributions go to pay for all benefits; there is very little investment income available to reduce the contribution requirement.

Defined contribution plans do not offer the same replacement income as defined benefit plans for every contribution dollar spent. This is due, in large part, to the fact the investment income of a professionally managed long term portfolio will far exceed the earnings of an individual investor.



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## **SECTION II**

### METHODOLOGY

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## SECTION II METHODOLOGY

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### SCOPE AND METHODOLOGY

During the 2014 Legislative Session, the Colorado General Assembly passed Senate Bill 14-214. This Bill requires the Office of the State Auditor to contract with a nationally recognized and enrolled actuarial firm to perform a comprehensive study comparing the cost and effectiveness of the Colorado Public Employees' Retirement Association Hybrid Defined Benefit Plan (PERA Hybrid Plan) to alternative plan designs in the public and private sector. The study must include the following:

- A comparison of the benefits, cost, and portability of benefits provided by the PERA Hybrid Plan with the benefits, cost, and portability of benefits provided by alternative plans.
- The impact that a change from the current PERA Hybrid Plan design to alternative plan designs would have on expected retirement benefits for current and future PERA retirees.
- A comparison of the current PERA Hybrid Plan design to other statewide public plans and private sector plans.
- The incremental impacts that a change from the current PERA Hybrid Plan to alternative plan designs would have on PERA's ability to fully amortize the unfunded accrued liability of each division.
- The impact that a change from the current PERA Hybrid Plan design to alternative plan designs would have on employers and taxpayers relative to the current PERA Hybrid Plan.

In accordance with Senate Bill 14-214, this report will:

- Outline where PERA stands today on the primary metrics of benefits, costs, and portability.
- Describe alternative plans and provide an analysis based on the impacts of a number of sample lives which represent the varying career lengths of the employee population and provide an analysis of alternative plans using standard sample lives.
- Describe what other similarly situated plans are doing as measured by these same metrics.

Section III provides general background information on defined benefit and defined contribution retirement plans. The section also includes a profile of the PERA Hybrid Plan describing PERA benefits, contributions, and recent legislation impacting PERA members.

Section IV outlines the metrics used to compare the PERA Hybrid Plan to other statewide public and private sector plans. For example, one common measurement, "replacement ratio," is used to

measure the amount of income at retirement as a percent of pre-retirement pay. Plans that have higher replacement ratios are providing greater benefits to their retirees. This section will also discuss benefit adequacy, the definition of adequacy, and the value that a replacement ratio needs to be in order to be deemed “adequate.” In looking at the replacement ratios that PERA provides, the sample membership has been divided into three main groupings: (1) short-length career members, (2) mid-length career members, and (3) long-length career members. With these groupings it will be easier for the reader to see the impact on members’ benefits for differing career lengths. This section also reviews termination and portability of benefits for short-term employees.

Section V compares benefits and contributions for the PERA Hybrid Plan to five alternative plan designs. Many alternatives exist along the retirement plan spectrum from defined benefit to defined contribution plans. For each alternative plan, this section of the report shows the amount of contributions necessary to pay for the same benefits provided under the PERA Hybrid Plan; conversely, this section also shows the level of benefits that would be available under the alternative plans for the same amount of contributions currently made under the PERA Hybrid Plan. This section uses sample lives to compare the benefits and contributions of the PERA Hybrid Plan with alternative plan designs.

This section also provides an analysis behind the assumed rate of return to be used when modeling individually directed defined contribution plans. While the PERA Hybrid Plan has an assumed rate of return of 7.5% per year (as adopted by the PERA Board), numerous studies have shown that the individual investor is not able to invest as well as a team of professionals over a sustained period of time. Debate continues on all the reasons for this difference; however, there are a couple of core reasons for this difference in return. One of the core reasons has to do with the structure and opportunity differences between the two plan types. A large defined benefit plan such as the PERA Hybrid Plan has access to alternative investments, can meet the large threshold investments required for some asset classes, can experience economies of scale, and has a different fee structure than that of the individual investor. On the other hand, the individual investor does not have the same education level or skill set as a professional investor and is subject to an overall phenomenon of “emotional investing.” While difficult to quantify the impact of these two primary drivers of the difference in returns, the report uses an assumed rate of return which broadly incorporates these two factors.

When comparing plan structures, the analysis must be based on those employees who would potentially be eligible to participate in a new plan structure. These employees are considered to be “new hires.” Therefore, throughout this report the comparisons will be made based on the new hires under the current PERA Hybrid Plan provisions, generally those provisions applicable to members hired on or after January 1, 2011.

Section VI compares the benefits, contribution rates, and funded ratio of the PERA Hybrid Plan to other statewide plans. In addition, this section compares PERA benefits to private sector plans.

Section VII discusses the potential impacts and costs to employees, employers, and taxpayers if the State transitions from the current PERA Hybrid Plan to an alternative plan. This transition cost section provides the basis for identifying the cost to transition to a new plan, the impact of a transition on paying off the unfunded liability, and the ongoing costs for the “legacy” group that would remain under the provisions of the prior plan.

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## **SECTION III**

### COLORADO PERA HYBRID PLAN PROFILE

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## SECTION III

### COLORADO PERA HYBRID PLAN PROFILE

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#### PENSION PLANS – GENERALLY

Pension plans come in two major structural types: a defined benefit plan, which defines a monthly benefit amount payable at retirement, and a defined contribution plan, which defines an annual contribution amount to be placed in a member's account. Blending these two structures, often referred to as "hybridization," is a common occurrence, where one plan is chosen and the features of the other are imbedded. The Colorado PERA Plan is a hybrid plan, consisting of both a defined benefit structure (a formula which creates the promised annuity at retirement) and defined contribution features (the employer match on a member's account balance, payable at termination or retirement).

The overall risk associated with a pension plan is the risk of the member not having enough funds in retirement. The elements and associated risks include the retiree outliving his or her money, investment return risk, and contribution rate risk, to name a few. The chosen plan type dictates the risks that the member, employer, and others will take on for the pension plan. The plan type and related risk are the outcomes of the desired pension policy for the employer. Traditional defined benefit plans place the majority of the investment and longevity risks on the employer because a defined benefit plan provides a lifetime benefit that is generally, based on a formula designed to provide a livable benefit to retirees, with the employer managing the investments. In other words, in a defined benefit plan the member is guaranteed the benefit no matter the investment return. Alternatively, a defined contribution plan transitions the majority of these risks to the member, who must manage the plan contributions to generate adequate retirement savings. In a defined contribution plan, the employee is guaranteed the contribution to be made in a given year, but there is no guarantee concerning the amount of the retirement income or how long the retirement income will last. In addition to these major risks are other risks that are not quite as clearly defined, such as the following:

- ✓ The risk that increased contribution requirements could be exchanged for salary increases.
- ✓ The risk that individuals who retire with inadequate retirement savings could lack retirement self-sufficiency and place a strain on governmental social services.
- ✓ The risk that reduced pension benefits might cause changes in predictable retirement patterns and negatively impact younger employee recruitment.

## COLORADO PERA HYBRID PLAN PROFILE

Established by state law in 1931, PERA operates by authority of the Colorado General Assembly and is administered under Title 24, Article 51 of the Colorado Revised Statutes. PERA was established before Social Security existed, and members covered under PERA are generally not covered under Social Security; however, most are covered under Medicare if hired after April 1, 1986. The statutes establish a hybrid defined benefit plan, set parameters for PERA, include employer and employee contribution requirements, and require annual actuarial valuations of the PERA Hybrid Plan. PERA has five divisions, the State Division (which includes State Troopers), the Schools Division, the Denver Public Schools Division (DPS), the Local Government Division, and the Judicial Division (Judges). The Denver Public Schools Retirement System was merged into PERA effective January 1, 2010.

In addition to retirement benefits, PERA offers disability benefits and death benefits, and retiree health care benefits through PERACare. New state employees and certain community college members are eligible for PERAChoice, the defined contribution plan into which those members may elect to participate in lieu of participating in the PERA Hybrid Plan. In addition, all PERA members can participate in the voluntary PERAPlus 401(k) and 457 plans.

## MEMBERSHIP

There were over 512,000 total members in PERA as of December 31, 2013. A large number of these, approximately 186,000 (36%), were non-vested terminated members. Non-vested terminated members are those employees who terminated employment with a PERA employer with less than 5 years of service, but left their employee contributions in the PERA Hybrid Plan after termination. These members are entitled to an immediate refund of their contributions or an annuity based on their account balance at age 65. The Schools Division had the largest number of active employees, with approximately 117,000 members (23%) and the Judges Division had the smallest number, with 332 members (<1 percent). Deferred vested members are those members who terminated employment with a PERA employer with 5 or more years of service and are entitled to a retirement benefit that has not yet commenced. A summary of the PERA members is shown in the table below by division and membership category.

PERA Hybrid Plan Membership as of December 31, 2013						
	State	Local Government	Schools	Denver Public Schools	Judges	Total
Active Members	55,354	11,954	117,727	14,816	332	200,183
Retirees and Beneficiaries	34,981	6,167	55,986	6,564	323	104,021
Deferred Vested Members	5,340	2,868	12,854	759	6	21,827
Non-Vested Terminated Members (entitled to immediate refund of contributions or age 65 Money Purchase Annuity)	63,759	20,286	96,832	5,501	5	186,383
Total	159,434	41,275	283,399	27,640	666	512,414

Source: Colorado PERA Comprehensive Annual Financial Report for the year ended December 31, 2013.

## RETIREMENT BENEFITS

Retirement benefits for PERA members are calculated in one of two ways: (1) Using a “Service Retirement Formula,” which is calculated based on the member’s years of service and highest average salary, or (2) using a “Money Purchase Annuity,” which is the annuity based on the member’s account balance including an employer match and interest. Retiring PERA members receive an annuity that is calculated as the greater of the Service Retirement Formula or the Money Purchase Annuity.

The Service Retirement Formula is calculated as equal to 2.5% multiplied by a member’s years of service multiplied by the average of the member’s three highest years of salary. For example, a member who worked 15 years and had a 3-year highest average salary of \$40,000 would receive a \$15,000 benefit each year ( $.025 \times 15$  years of service  $\times$  \$40,000 average 3 year’s salary equals \$15,000 per year benefit). This benefit is payable beginning when the member is age 65 with 5 years of service or when the member is eligible for an unreduced retirement benefit. Unreduced retirement benefits are payable at any age with 35 years of service, or for a member hired on or after January 1, 2017, when that member’s age and service added together equals 90 (Rule of 90) with a minimum age of 60. The Schools and Denver Public Schools Divisions have a Rule of 88 with a minimum age of 58. In addition, reduced retirement benefits are available when a member reaches age 60 with 5 years of service, age 55 with 20 years of service, or age 50 with 25 years of service.

The Money Purchase Annuity is calculated at retirement by converting the member’s accumulated contributions with interest, plus a 100% employer match, to an annuity using PERA’s long-term rate of return assumption of 7.5%. Members who have reached retirement eligibility age with 5 or more years of service are entitled to the greater of the Service Retirement Formula or the Money Purchase Annuity. Members at age 65 with less than 5 years of service are entitled to the Money Purchase Annuity.

PERA members also have the option of taking a lump sum payment if they terminate employment prior to retirement eligibility; this is the defined contribution component of the PERA Hybrid Plan that makes it a hybrid plan. Terminating members have the option of taking a refund of their employee contributions, accumulated with interest, currently at 3.0% (but allowed in statute to be as high as 5.0%), along with a 50% employer match at termination before retirement eligibility. There is a 0% employer match if the member has less than 5 years of service and chooses to take a refund prior to retirement eligibility, but the member receives his or her member contributions and accumulated interest. A member may also choose to leave his or her contributions in PERA and allow them to accumulate with 3.0% interest until they refund or retire. At retirement eligibility, the member would receive a 100% employer match on his or her accumulated contributions.



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**ANCILLARY BENEFITS**

In addition to retirement benefits, the PERA Hybrid Plan provides the following ancillary benefits to its members.

**Disability Benefits**

Members with 5 or more years of earned service credits, with at least 6 months of this time earned in the most recent period of membership, are eligible to apply for short-term disability or a full disability retirement. To be eligible for a full disability retirement, the member must be found to be totally and permanently disabled. The service credit requirement is waived for state troopers injured in the line of duty. The disability retirement benefit is calculated as the regular retirement benefit and, if the years of service credit at disability are greater than 20, the disability retirement benefit is calculated based on actual service at disability. If the years of service at disability are less than 20, then the disability retirement benefit is calculated based on actual service credit at disability plus service credit projected to age 65. In this scenario, the service credit cannot exceed 20 years.

**Death Benefits**

Death benefits are available to beneficiaries of members immediately upon the member's death. If the deceased member was not eligible for retirement at the time of death, then benefits are payable to qualified children under the age of 23, the spouse, and others in a descending order of priority. If no qualified children exist and if the member had 10 or more years of service, then the survivor benefit payable would be the greater of 25% of the member's highest average salary or the benefit that would have been payable as a 100% joint and survivor option if the deceased member had been eligible for service retirement and retired on the date of death.

**Post-retirement increases-COLA**

The PERA Hybrid Plan provides post-retirement benefit increases (also known as Cost of Living Adjustments, or COLAs) to help reduce or eliminate the deterioration in purchasing power of benefits. The ability of retirees to maintain their purchasing power into their retirement years is another component of pension policy. For example, a member may retire with pension benefits immediately upon retirement that provide the same standard of living the member enjoyed prior to retirement. However, if that benefit is frozen and does not increase in subsequent years, then as the years go by, the retiree's standard of living, based on that income stream, will decline. Social Security also provides an annual COLA increase in the private sector, and the purpose of that increase is to help retirees retain some of their purchasing power.

The PERA Hybrid Plan has modified the COLA provisions for members hired on or after January 1, 2007. An Annual Increase Reserve was established with 1% of the employer's statutory contributions going in to prefund the COLAs. The annual COLA is limited to the lesser of 2% or Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W), with a further restriction based on the size of the Annual Increase Reserve for each division.

## Termination Benefits

The PERA Hybrid Plan provides benefits to members who terminate employment prior to retirement. For members who elect to receive a refund of their PERA account and meet the requirements for a service or reduced service retirement at the time the match is applied (e.g., the terminated member left their funds at PERA until their retirement date), or for payments made to survivors or beneficiaries of members who die before retirement, the match is 100% of eligible amounts. For PERA members who receive a refund prior to meeting the requirements for a service or reduced service retirement and who have 5 or more years of service, the match is 50% of eligible amounts. For PERA members who receive a refund prior to meeting the requirements for a service or reduced service retirement and who have less than 5 years of service, there is no match on their contributions.

## PERACARE

Anyone receiving a monthly PERA Hybrid Plan benefit is eligible to enroll in PERACare. PERACare provides a monthly medical premium subsidy; survivors of retirees are also eligible to receive the subsidy. For PERA (non-Denver Public Schools Division) members, the benefit is \$5.75 per year of credited service (up to 20 years) if the retiree is age 65 or older or eligible for Medicare Part B; and \$11.50 per year of credited service (up to 20 years) if the retiree is not yet age 65 or not eligible for Medicare Part B. The Denver Public Schools Division has the same benefit amount unless the member was hired prior to 1994. Employers are assessed 1.02% of payroll for the costs of PERACare, which goes into the Health Care Trust Fund.

## PERACHoice, PERAPLUS 401(K) AND 457 DEFINED CONTRIBUTION PLANS

New State Division employees and some new community college employees are eligible for PERACHoice, which allows them to choose at the time of hire between participating in PERA's Hybrid Defined Benefit or Defined Contribution Plans. Both the PERA Hybrid Plan and Defined Contribution Plan have an employee contribution rate of 8.0%. However, the vesting schedule for the employer contribution or match is different for the two plans and this difference may have a bearing on which plan the participant elects. The Defined Contribution Plan vests the participant immediately in 50% of the employer contribution and vests 10% for each additional year of participation, with 100% vesting in the employer contributions at the end of 5 years, while the PERA Hybrid Plan has a match of 50% after 5 years, with a 100% match at retirement eligibility.

A one-time irrevocable option exists for an eligible member to switch between the PERA Hybrid Plan and Defined Contribution Plan, between 13 months and 72 months of participation. For example, if a member joins the PERA Hybrid Plan at the time of hire and then after 2 years decides that the Defined Contribution Plan is preferable, that member can transfer to the Defined Contribution Plan and start earning participation service in that plan. This holds true for someone in the Defined Contribution Plan who wants to switch to the PERA Hybrid Plan. This flexibility adds another layer of choice and portability to the PERA retirement program.

If a member switches from the PERA Defined Contribution Plan to the PERA Hybrid Plan, the member begins to earn service credit in the PERA Hybrid Plan on the date of the switch (and not retroactively back to his or her original date of hire) so that there is no vested benefit or past service liability for the participant reflected in the PERA Hybrid Plan. Similarly, if a participant switches from the PERA Hybrid Plan to the PERA Defined Contribution Plan, the participation service and the employer matching vesting schedule in the PERA Defined Contribution Plan starts on the date of the switch and does not count participation service in the PERA Hybrid Plan. The participants retain their rights to the accumulated contributions from the previous plan.

Note that this option to participate in the PERA Defined Contribution Plan under PERAChoice is different than options provided by many private sector employers because PERA members who choose this option are not in Social Security, while private sector employees who participate in a defined contribution plan also have a Social Security benefit. Thus, there may be some PERA members who participate in the PERA Defined Contribution Plan who do not have the protection of a companion Social Security plan. This increases the risk that a member could outlive his or her retirement funds. Below is a summary of features of the PERA Hybrid Defined Benefit (DB) and PERA Defined Contribution (DC) plans.

PERA HYBRID DEFINED BENEFIT AND PERA DEFINED CONTRIBUTION COMPARISON CHART		
	PERA Hybrid DB Plan	PERA DC Plan
How Each Plan Works		
Lifetime retirement benefit option (annuity)	Yes	No
Account balance	Based on 3% interest	Based on investment returns
Retirement benefit dependent on the success of employee's investment choices	No	Yes
Potential annual increase to retirement benefit	Yes	No
Employee manages own investments	No	Yes
PERA invests on employee's behalf	Yes	No
Access to survivor benefits (death benefits)	Yes	Account balances
Access to disability benefits	Yes	Account balances
One-time irrevocable option to switch plans	Yes, DB service credit begins at date of switch (for new state and community college employees only)	Yes, DC vesting service begins at date of switch (for new state and community college employees only)
Access to PERACare Health Benefits Program for retirees	Yes	If purchase a lifetime annuity upon termination of PERA-covered employment
Access to PERAPlus 401(k) and 457 Plans	Yes	Yes
Access to life insurance	Yes	Yes
Investment advice available	In voluntary PERAPlus programs	Yes
Receive a percentage of employer contributions, or a match, if employee withdraws account	50% match after 5 years of service or 100% match at retirement eligibility	50% vesting in employer contributions immediately and a graded vesting schedule with 100% vesting after 5 years
Fees	Not directly	Yes
Social Security offset applies	Yes	Yes

Source: Based on *PERAChoice: The PERA Defined Benefit Plan and the PERA Defined Contribution Plan*, October 2014. Information from Colorado PERA website as updated by Gabriel, Roeder, Smith & Company.

In addition to PERA's Hybrid and Defined Contribution Plans, PERA offers all members the opportunity to save for retirement in the PERAPlus 401(k) plan and some are also eligible for the 457 plan. PERA offers these voluntary retirement savings plans with the same investment advantages offered in the PERA Defined Contribution Plan, allowing employees to save for retirement on a pre-tax basis.

### SUMMARY OF PERA BENEFIT PROVISIONS FOR NEW HIRES

The following table provides a summary of Colorado PERA benefits. This table shows the PERA Hybrid Plan provisions and benefits that are applicable to new hires (i.e., employees hired on or after January 1, 2011). As discussed previously, these provisions will be used throughout this report when comparing the PERA Hybrid Plan to alternative plans.

Summary of PERA Hybrid Plan Benefit Provisions for New Hires			
	State/Local Government	Schools/Denver Public Schools	Judges
Service Retirement	Age 65 with 5 years of service, Rule of 90 with minimum age 60 (for new hires on or after January 1, 2017), Any age with 35 years of service	Age 65 with 5 years of service, Rule of 88 with minimum age 58, Any age with 35 years of service	Same as State
Early Retirement Eligibility	Age 60 with 5 years of service, Age 55 with 20 years of service, Age 50 with 25 years of service	Same as State	Same as State
Early Retirement Reduction	Actuarial Equivalent Factors	Same as State	Same as State
Vested Termination	5 years of service or age 65	Same as State	Same as State
Highest Average Salary	Average of the highest annual salaries associated with 3 periods of 12 consecutive months of service credit. Salary increases to use in highest average salary are limited to 8% per year	Same as State	Average of the highest 12 months of salary
Service Retirement Formula	2.5% x Highest Average Salary x Years of Service	Same as State	Same as State
Interest Credit Rate for Contributions	3%	Same as State	Same as State
Accumulated Employee Contributions	Employee contributions with interest	Same as State	Same as State
Employer Match of Member Contributions	100% match on accumulated contributions if eligible for service or early retirement. 50% match if not eligible for retirement and have 5 years of service and take refund at termination date or 100% match if leave contributions in PERA until eligible for retirement. 0% match if less than 5 years of service and take the refund at termination date or 100% match if leave contributions in PERA until eligible for retirement.	Same as State	Same as State
Money Purchase Annuity	Annuity calculated from converting Accumulated Employee Contributions plus employer match to an annuity, using 7.5% assumption	Same as State	Same as State
Refund of Member Contributions (Amount Eligible for Withdrawal)	Upon termination other than retirement, accumulated contributions plus matching employer contributions are refunded upon request. Alternatively, the contributions can be left in PERA until retirement eligibility, at which time the accumulated contributions plus matching employer contributions can be refunded or the employee can receive the greater of a Service Retirement (if greater than 5 years of service) or Money Purchase annuity.	Same as State	Same as State
Post-Retirement Increase Provisions	Lower of 2% or average CPI-W, limited to 10% of the funds in the Division's Annual Increase Reserve	Same as State	Same as State
Disability Retirement	Eligible after 5 years of service and totally and permanently disabled	Same as State	Eligible upon totally and permanently disabled
Survivor Benefits	Eligible after 1 year of service	Same as State	Same as State
PERACare	PERA retirees, spouse, disabled and survivors are eligible. Funded by employer contributions to the Health Care Trust Fund	Same as State	Same as State

Source: Based on plan provisions for new hires (i.e., employees hired on or after January 1, 2011), including those with future effective dates, under Article 24-51, C.R.S., as summarized by Gabriel, Roeder, Smith & Company.

## CONTRIBUTIONS

Contributions made to the PERA Hybrid Plan are established in Colorado statutes. Members in all divisions contribute 8.00% of their salary, except for State Troopers who contribute 10.00% of their salary (Section 24-51-401, C.R.S.).

Employers contribute a Statutory Employer Rate to PERA for each employee. The Statutory Employer Rate, which varies for each division, is a percentage of total employee payroll that includes both a basic amount and a 1.02% contribution to the Health Care Trust Fund to fund PERACare. In addition to the Statutory Employer Rates, employers are required to make Amortization Equalization Disbursement (AED) and Supplemental Amortization Equalization Disbursement (SAED) contributions for each employee. Legislation was passed in 2004 regarding AED and in 2006 regarding SAED requiring employers to make additional contributions to PERA in order to reduce PERA's unfunded liability and shorten the amortization period to pay off the unfunded liability. The AED and SAED contributions, varying by division, are made until the division's actuarial funded ratio exceeds 103%, at which time the AED and SAED will be reduced by 0.5% (Section 24-51-411, C.R.S.).

The total contribution rates, by division, as of January 1, 2015, are shown below:

PERA Hybrid Plan Contribution Rates as of January 1, 2015								
Division	Employee Rate	Statutory Employer Rate			Amortization of the Unfunded Disbursement Contribution		Total Employer Rate	Total Employee and Employer Rate
		Basic Amount <sup>1</sup>	Health Care Trust Fund	Total Employer Statutory Rate	AED	SAED		
State (excluding Troopers) <sup>2</sup>	8.00%	9.13%	1.02%	10.15%	4.20%	4.00%	18.35%	26.35%
State (State Troopers only) <sup>2</sup>	10.00%	11.83%	1.02%	12.85%	4.20%	4.00%	21.05%	31.05%
Local Government	8.00%	8.98%	1.02%	10.00%	2.20%	1.50%	13.70%	21.70%
Schools <sup>3</sup>	8.00%	9.13%	1.02%	10.15%	4.20%	4.00%	18.35%	26.35%
Denver Public Schools <sup>3 4</sup>	8.00%	9.13%	1.02%	10.15%	4.20%	4.00%	18.35%	26.35%
Judicial	8.00%	12.64%	1.02%	13.66%	2.20%	1.50%	17.36%	25.36%

Source: Information from *Colorado PERA Law*, Colorado PERA website as updated by Gabriel, Roeder, Smith & Company.

<sup>1</sup> For employees hired on or after January 1, 2007 (January 1, 2010 for Denver Public Schools), 1.00% of this amount is allocated to an Annual Increase Reserve to pre-fund their post-retirement increases.

<sup>2</sup> AED and SAED increase to 4.60% and 4.50% respectively in 2016 and to 5.00% and 5.00% respectively in 2017 and later.

<sup>3</sup> AED and SAED increase to 4.50% and 4.50% respectively in 2016, to 4.50% and 5.00% respectively in 2017 and to 4.50% and 5.5% respectively in 2018 and later.

<sup>4</sup> House Bill 15-1391 reduced Denver Public Schools total employer statutory rate to 10.15% effective January 1, 2015. Denver Public Schools employers are permitted to reduce contributions by Certificates of Participation under Section 24-51-412, C.R.S.

**2010 BENEFIT LEGISLATION – SENATE BILL 10-001**

In 2010, the Colorado General Assembly passed Senate Bill 10-001 which changed the PERA Hybrid Plan's benefits for new hires and increased contributions, with the goal of the Hybrid Plan reaching a 100% funded ratio within 30 years. Some of the primary changes in the Bill were to increase the AED and SAED contribution rates, make the early retirement reductions to be actuarial equivalent, reduce the maximum salary increase for the 3-year average salary calculation to eliminate salary spiking, establish a 5-year vesting period for new employees to get a 50% match on contributions, and modify the "Rule of" eligibility dates when an employee can get an unreduced benefit based on age and service.

Members hired on or after January 1, 2007 are covered under plan provisions that set the COLA equal to the lesser of 2.0% or CPI-W, with a further restriction based on the size of the Annual Increase Reserve for each Division.

The actuarial valuation of benefits for employees hired after January 1, 2007 does not include any assumption for COLAs since they receive annual increases only to the extent affordable (Colorado PERA Comprehensive Annual Financial Report for the year ended December 31, 2013). This is an important assumption in sections that follow since comparisons involving PERA costs for new hires will not contain a COLA assumption.

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## **SECTION IV**

### **PERA HYBRID PLAN REPLACEMENT RATIOS AND PORTABILITY FEATURES**

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## SECTION IV

### PERA HYBRID PLAN REPLACEMENT RATIOS AND PORTABILITY FEATURES

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#### PERA – REPLACEMENT RATIOS-MEASURING BENEFIT EFFECTIVENESS

In order to compare the cost and effectiveness of the PERA Hybrid Plan’s benefits, contributions, and portability, the measures for such a comparison must first be developed. To create an “apples to apples” comparison, these measures must be able to be applied to any retirement system. This section describes those measures and analyzes the PERA Hybrid Plan benefits with these measures so that a baseline for comparison is established. To measure the benefits, the common industry metric of “Replacement Ratio” will be used.

#### KEY FINDINGS

*Similar to other plans when viewed as a sole source of income, replacement ratios for the PERA Hybrid Plan do not meet generally prescribed retirement adequacy targets. The implication of this finding is that, like other public and private retirement plans, members will need to supplement their retirement income with personal savings (or find some other source of retirement income) in order to retire and maintain their pre-retirement standard of living.*

*The PERA Hybrid Plan provides termination benefits that may be taken from PERA, or retained with a guaranteed growth in their value. Members with 5 years of service receive a 50% match of their contributions (plus interest) upon termination and, if they leave their funds in PERA until retirement eligibility, they receive a 100% match of their contributions.*

#### REPLACEMENT OF PRE-RETIREMENT INCOME AND BENEFIT ADEQUACY

Retirement systems, combined with members’ personal savings, generally work within a framework of enabling career employees to have the opportunity to maintain a similar standard of living immediately into retirement as they had prior to retirement. The standard of living is measured by an individual’s “take-home” pay. Thus, for career employees, if their take-home pay is similar pre- and post-retirement, then they are deemed to have maintained a similar standard of living.

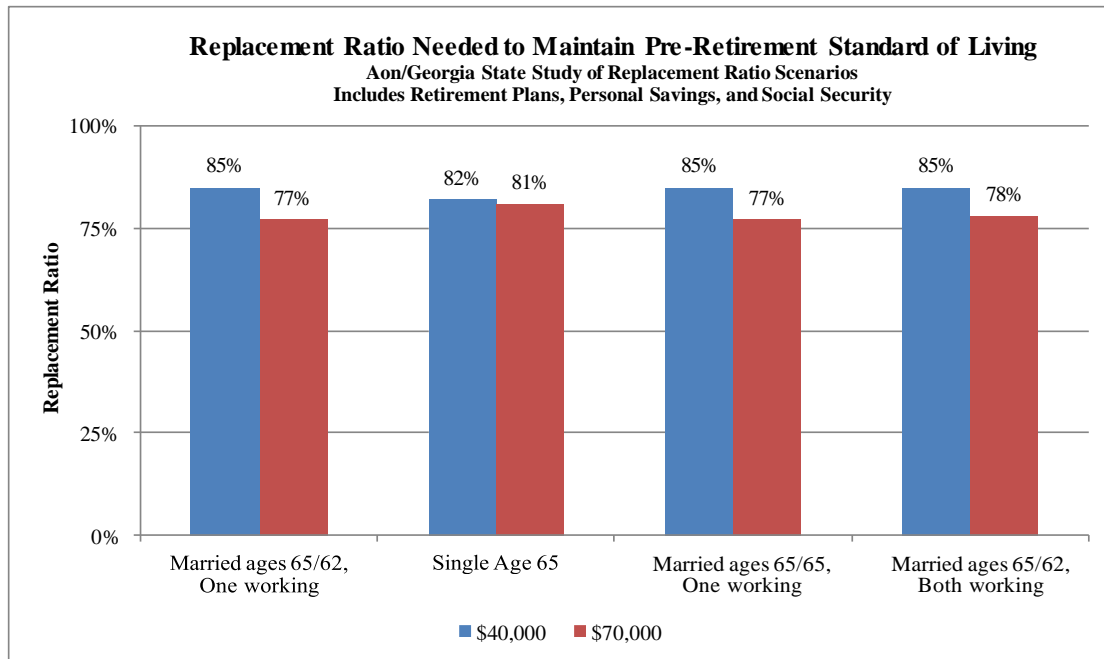
It is possible for a retiree’s income to be less than pre-retirement total income but still provide the same “take-home” pay. This is because taxes, savings, and other expenditures change when a member moves from employment to retirement. As an example of the differences between gross pay and take-home pay, assume a member earns \$50,000 in gross pay, and that after taxes, pension contributions, and other expenses, that \$50,000 translates into \$25,000 of take-home pay. Next, assume that member retires and his or her retirement benefit is \$35,000 per year and, after taxes, expenses etc., that \$35,000 translates into \$25,000 in take-home pay. In this example, the member’s standard of living is maintained, since the take-home pay before and after retirement is the same.

Retirement policy generally provides for a career employee to be able to maintain their pre-retirement standard of living when considering all sources of retirement income. Employers support this policy so that the retirement income is not too high (thereby using resources to generate wealth) or too low (thus restricting a career member's ability to retire according to their own situation). The sources of replacement income which an employee may use to replace their pre-retirement income include Social Security, personal savings, and retirement plans. For PERA Hybrid Plan members, Social Security is not a source of replacement income unless the employee worked for a Social Security employer at some time during his or her career.

In order to measure the efficacy of the retirement system, the common industry metric used is "replacement ratios." Replacement ratios are the proportion of retirement income to total pay immediately prior to retirement. For example, if an employee earns an annual pre-retirement gross income of \$50,000 and receives an annual retirement benefit of \$35,000, then the replacement ratio is 70%.

Numerous studies have been conducted over the years to answer the question as to what constitutes adequate replacement income (where adequacy means that the career employee will neither have a decrease nor an increase in their standard of living as a consequence of their retirement). An adequate ratio is generally recognized as one that allows retirees to maintain a similar standard of living post retirement and accounts for the fact that some major expenses are eliminated in retirement, such as saving for retirement and certain taxes.

The chart below shows an excerpt from the industry accepted replacement ratio study conducted by Georgia State University and AON Consulting, varying results by income and marital status. While there are not huge differences between the various family structures, the differences that exist are due to income tax tables and tax exemptions applying to different situations, the amount of Social Security taxes paid pre-retirement (two-worker family will be paying higher Social Security taxes), and the amount of Social Security benefits payable after retirement. The results are shown for pre-retirement pay of \$40,000 and \$70,000.



Source: 2008 *Replacement Ratio Study: A Measurement Tool for Retirement Planning* by Georgia State University and Aon Consulting. GSU/Aon Retire Project Report. Bruce A. Palmer Ph.D. Center for Risk Management and Insurance Research, Georgia State University Atlanta, GA Research Report NO. 08-1, June 2008.

This study demonstrates that if the combination of personal savings, Social Security, and a pension benefit are equal to 77% to 85% of pre-retirement pay, then the member's standard of living can be maintained at retirement. Lower paid members require a higher percentage of replacement income, and vice versa.

### REPLACEMENT RATIOS FOR SAMPLE PERA EMPLOYEES

This study calculated the replacement ratios provided by the current PERA Hybrid Plan for a sample of PERA employees with differing career lengths. Replacement ratio is calculated as the ratio of the benefit payable at age 65 (or earlier if indicated), divided by the member's pre-retirement pay. Since PERA members do not participate in Social Security, the analysis in this section shows pension benefits only. Appendix C provides detail on the underlying assumptions used in these results.

Retirement plans are often designed to meet a target replacement ratio for a full career employee, in this case age 65 with 30 years of service. However, the mobility of the workforce has increased in recent years and many employees do not stay in one job for their entire career. From an analysis of the PERA Hybrid Plan data on participant behavior (see Appendix H), it is clear that many participants leave PERA service prior to age 65. To recognize the diversity in employee career lengths and age at hire, this study calculated replacement ratios for a variety of sample lives to determine the level of benefits provided by the PERA Hybrid Plan to employees with a long-length career, mid-length career, and short-length career.

Based on analysis of PERA member behavior shown in the data in Appendix H and with input from the OSA and Colorado PERA, specific sample lives were chosen to illustrate a cross-section of PERA employees. The sample employees were chosen to illustrate the benefits available to career employees, as well as the termination and portable benefits available to employees who leave PERA service prior to retirement. The following sections look at replacement ratios for members who work until age 65 or until their unreduced retirement age eligibility, or who work for shorter periods of time, such as 10 to 20 years. In addition, short-service participants with less than 10 years have been included to illustrate the level and portability of their PERA benefits.

The analysis is based on the current PERA Hybrid Plan provisions which use the greater of the Service Retirement Formula or Money Purchase Annuity to determine a member's benefit. As mentioned previously, the Service Retirement Formula is equal to 2.5% per year of service times highest average 3 year's salary. Under the current Plan, new hires may retire with an unreduced benefit at any age with 35 years of service, or under the Rule of 90 for those hired on or after January 1, 2017 (age plus service equals 90) with a minimum age of 60, or age 65 with 5 years of service. Instead of the Rule of 90, the Schools and Denver Public Schools Divisions have a Rule of 88 (age plus service equals 88) with a minimum age of 58.

### **Long-Length Career—Full Career or Normal Retirement (More than 20 years of service)**

A full career employee is defined as one who retires with 30 years of service at age 65. The definition of a career employee is a critical assumption for the study of replacement ratios, since the career employee should be receiving the "full career" amount of replacement income from the retirement plan, and partial career employees would receive a portion of the career benefit. This theory was developed based on the understanding that other employers would be providing a portion of the benefit for partial career employees based on the time that the member spent at the other employer.

For a 30-year full career employee, the PERA Hybrid Plan replaces approximately 72.2% of the employee's pre-retirement pay. This indicates that the design of the PERA Hybrid Plan is to provide the bulk, but not the entirety, of a full career member's retirement income. This ratio was calculated by multiplying 2.5% times "final average 3 year's salary" times "years of service," divided by "final year salary." The 72.2% replacement ratio applies only to replacement income at the moment of retirement; any post-retirement increases will affect the purchasing power over time.

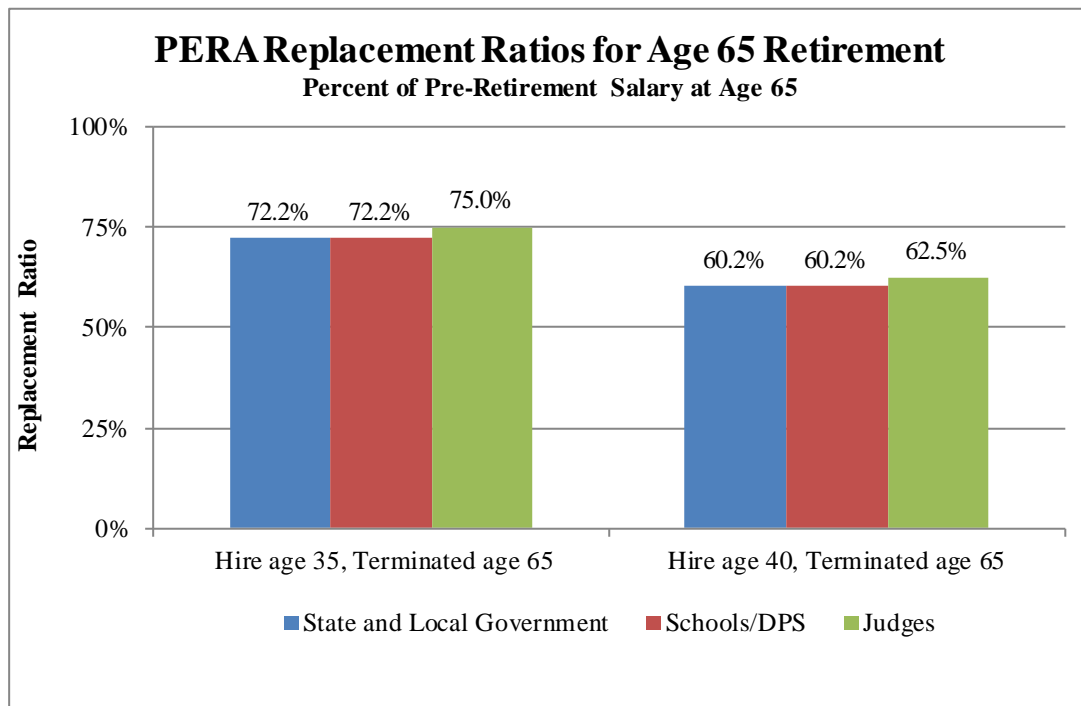
In addition to the 30-year, age 65 full career employee, the study also calculated replacement ratios for a participant eligible for a normal retirement benefit after a career of 25 years of service since PERA data shows that some participants retire with fewer than 30 years of service.

The following sample lives were studied:

#### **Retirement – Normal**

- Hired at age 35 and terminates at age 65 with 30 years of service
- Hired at age 40 and terminates at age 65 with 25 years of service

The following graph shows the replacement ratios for each PERA division.



Source: Gabriel, Roeder, Smith & Company.

As the graph shows, Judges have a slightly higher replacement ratio because their benefit formula uses final pay instead of an average of 3 years of pay. In addition, the graph shows that a participant hired at age 40 and working until age 65 receives approximately 60.2% (62.5% for Judges) of pre-retirement pay, and that percent declines as the service earned declines. It is anticipated that participants hired later in their careers will have other pension or savings already accrued to supplement these lower replacement ratios.

### **Long-Length Career—Retiring when Eligible for “Rule of” Unreduced Benefits**

Another long-length career employee is defined as one who retires with an unreduced benefit payable prior to the normal retirement age of 65.

For members who are hired at age 25 and stay until eligibility for an unreduced benefit (Rule of 88 for the Schools and Denver Public Schools Divisions or Rule of 90 for the other Divisions’ new hires on or after January 1, 2017), the PERA Hybrid Plan replaces approximately 79% to 88% of the employee’s pre-retirement pay. This is the only scenario where the PERA Hybrid Plan, as a sole source of retirement income, provides a replacement ratio that meets adequacy target levels of 77% to 85% as discussed previously.

The following sample lives were studied:

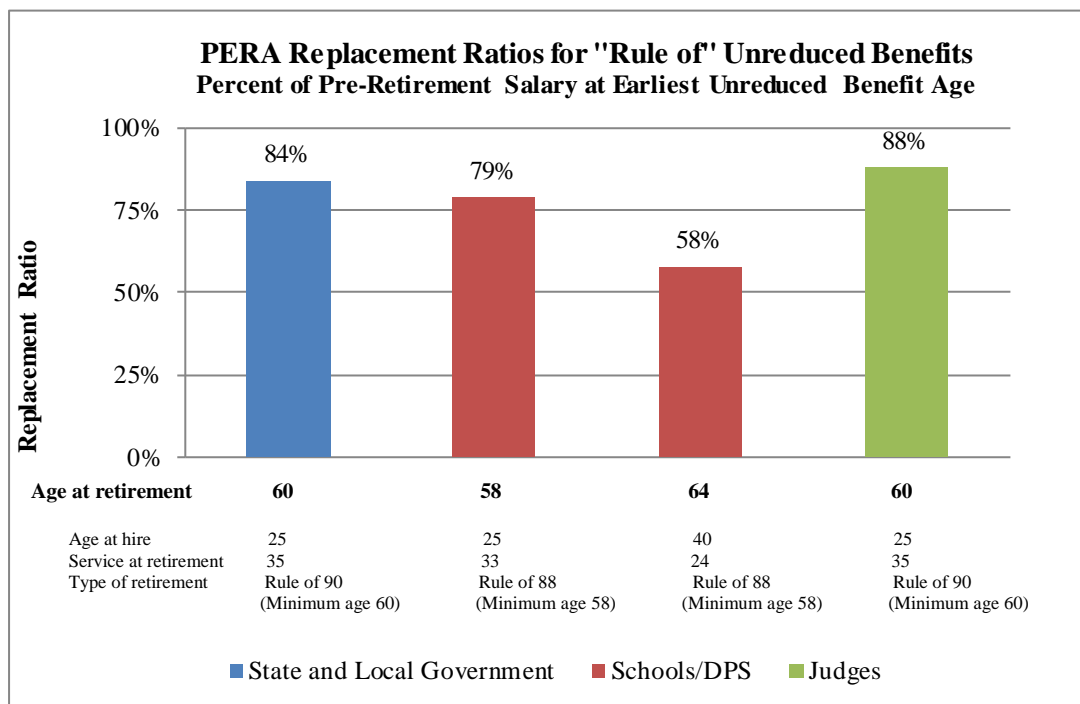
Retirement-Rule of 88, minimum age 58 (Schools and Denver Public Schools Division)

- Hired at age 25 and terminates at age 58 with 33 years of service
- Hired at age 40 and terminates at age 64 with 24 years of service

Retirement-Rule of 90, minimum age 60 (State, Local, and Judges Divisions)

- Hired at age 25 and terminates at age 60 with 35 years of service

Unreduced benefits are available to members prior to age 65 under certain situations. The State, Local Government, and Judges Divisions have a Rule of 90 with minimum age of 60 for new hires on or after January 1, 2017, and the Schools and Denver Public Schools Divisions have a Rule of 88 with minimum age of 58, that allow a participant to receive an unreduced benefit payable prior to age 65. The charts below show the replacement ratios for participants who earn an unreduced benefit, but do not necessarily stay until age 65. The Judges Division has a higher replacement ratio because the benefit formula uses final salary instead of final average 3 year's salary.



Source: Gabriel, Roeder, Smith & Company.

An employee who is hired mid-career at age 40 reaches a replacement ratio of 58%. Mid-career hires are expected to have had prior employment with additional benefits or savings already accrued to supplement the PERA benefit.

### Mid-Length Career (11-20 years of service)

A mid-length career employee is defined as one who terminates PERA service with 11 to 20 years of service.

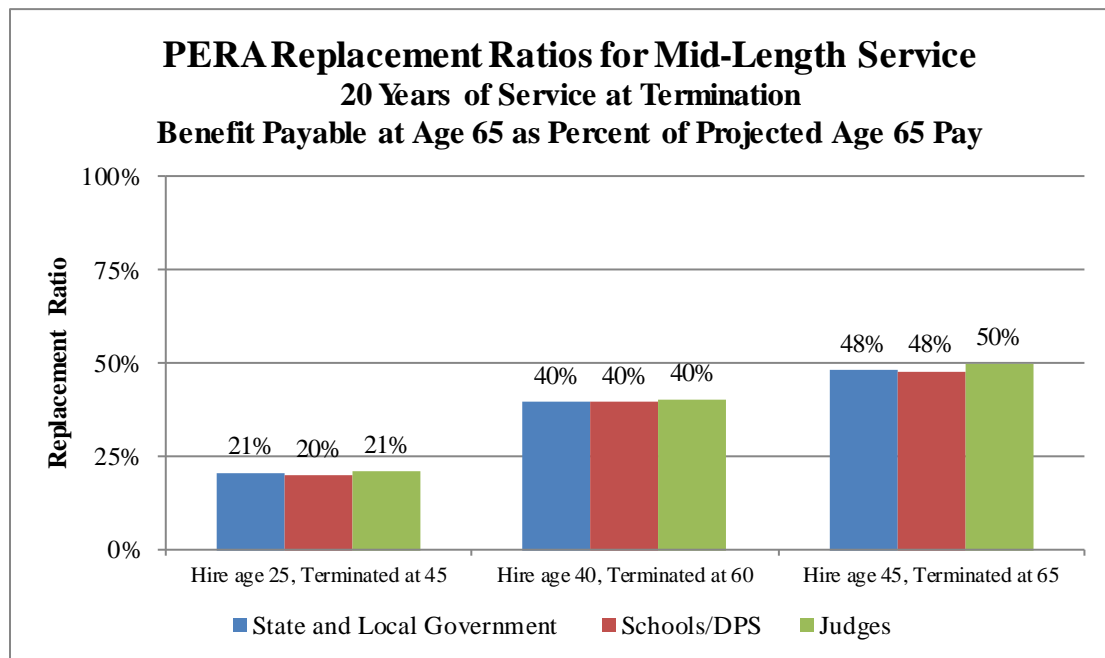
For a mid-length career employee with 20 years of service, the PERA Hybrid Plan replaces approximately 20% to 50% of the employee's pre-retirement pay. Adequacy targets for partial career members are a fraction of the total adequacy target levels.

Participants with 11 to 20 years of service will range from terminated vested participants who leave fairly young to participants hired later in their careers who work until eligibility for early or unreduced retirement eligibility.

The following sample lives were studied assuming 20 years of service at termination:

#### Terminated Vested

- Hired at age 25 and terminates at age 45 with 20 years of service  
Retirement – Early (benefit shown payable at age 65)
- Hired at age 40 and terminates at age 60 with 20 years of service  
Retirement – Normal
- Hired at age 45 and terminates at age 65 with 20 years of service



Source: Gabriel, Roeder, Smith & Company.

Participants receive the greater of the Service Retirement Formula or the Money Purchase Annuity, payable at age 65 for these illustrations. For these participants, the Service Retirement Formula using 2.5% of pay multiplied by years of service provides the greater benefit. At termination, the participants all have a benefit equaling 50% of their 3 year average pay (.025 x 20

years of service). However, by the time they reach retirement age, the employee who terminates at age 60 will have only a few years of growth in his or her pay while the one who terminates at age 45 will have the potential for higher earnings in subsequent jobs, making the termination benefit a lesser percent of the 45 year old's final pay.

### Short-Length Career (0-10 years of service):

A short-length career employee is defined as one who terminates prior to age 65 with 10 or fewer years of service. For short-length employees, the PERA Hybrid Plan replaces approximately 2% to 25% of the employee's pre-retirement pay. Adequacy targets for very short-length employees are a fraction of the total retirement targets. Portable benefits are often more meaningful for short-length service employees, who receive a guaranteed interest rate and a 100% match on contributions if left in the plan until retirement eligibility.

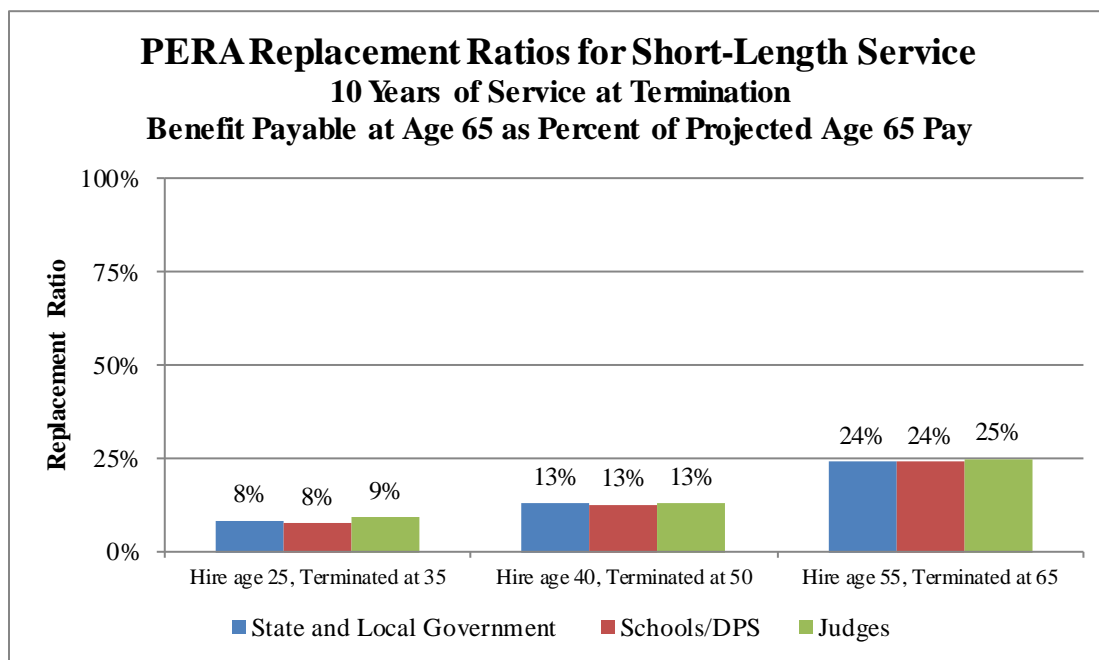
The following sample lives were studied with 10 years of service at termination:

#### Terminated Vested

- Hired at age 25 & terminates at age 35 with 10 years of service
- Hired at age 40 & terminates at age 50 with 10 years of service

#### Retirement –Normal

- Hired at age 55 and terminates at age 65 with 10 years of service



Source: Gabriel, Roeder, Smith & Company.

Adequacy targets for very short-career members are a fraction of the total retirement targets. The benefit received by these participants is the greater of the Service Retirement Formula or the Money Purchase Annuity, payable at age 65 for these illustrations. To illustrate how these two formulas interact, examples are shown in the table below for the State Division. The Money Purchase Annuity tends to “win” for younger, short service employees.



Sample Employee Replacement Ratios Comparing the Service Retirement Formula and the Money Purchase Annuity			
	Hire age 25 Hire salary \$25,000 Term at 35	Hire age 40 Hire salary \$45,000 Term at 50	Hire age 55 Hire salary \$55,000 Term at 65
Accumulated employee contributions at termination	\$31,400	\$51,400	\$60,000
Accumulated employee contributions at age 65 (3% growth)	\$76,200	\$80,100	\$60,000
Accumulated contributions at age 65 including 100% employer match	\$152,400	\$160,200	\$120,000
Money Purchase Annuity (Accumulated contributions converted to annuity at age 65)	\$15,086	\$15,857	\$11,882
Service Retirement Formula (2.5% times pay times service at term)	\$10,759	\$16,589	\$18,819
Greater of two	Money Purchase	Service Retirement	Service Retirement
As a percent of age 65 projected pay	8%	13%	24%

Source: Gabriel, Roeder, Smith & Company.

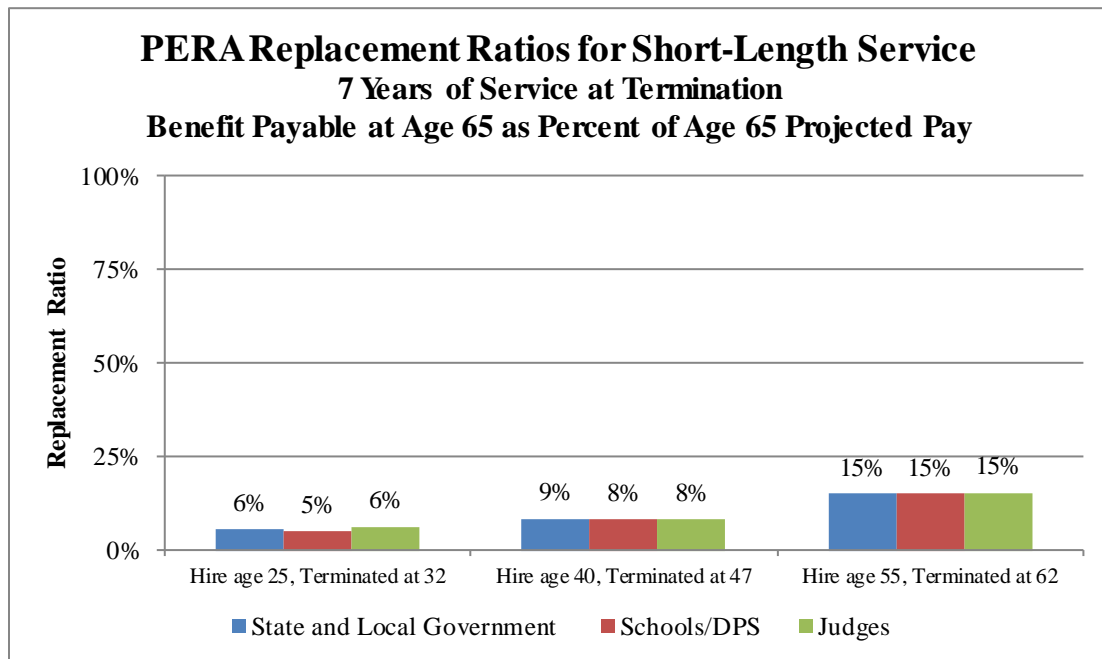
The following sample lives were studied with 7 years of service at termination:

Terminated Vested

- Hired at age 25 and terminates at age 32 with 7 years of service
- Hired at age 40 and terminates at age 47 with 7 years of service

Retirement – Early (benefit shown payable at age 65)

- Hired at age 55 and terminates at age 62 with 7 years of service



Source: Gabriel, Roeder, Smith & Company.

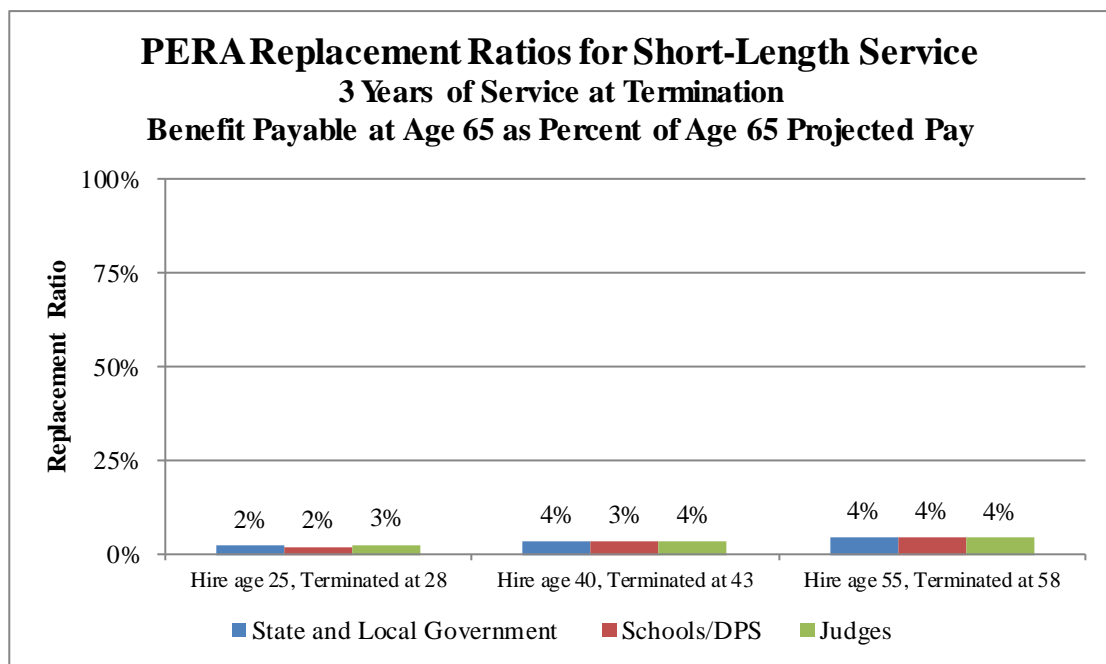
Adequacy targets for very short-career members are a fraction of the total adequacy targets.

The Money Purchase Annuity is greater than the Service Retirement Formula for employees hired at ages 25 and 40. The Service Retirement Formula is greater for the employee hired at age 55. The reason that the retirement-age replacement ratios are so similar (5%-6% and 8%-9%) is that the Money Purchase Annuity continues to grow with interest after the member terminates employment. The third example (hire age 55, termination at age 62) will be eligible to receive the Service Retirement Formula.

The following sample lives were studied with 3 years of service at termination:

**Non-Vested Termination**

- Hired at age 25 and terminates at age 28 with 3 years of service
- Hired at age 40 and terminates at age 43 with 3 years of service
- Hired at age 55 and terminates at age 58 with 3 years of service



Source: Gabriel, Roeder, Smith & Company.

Adequacy targets for very short-career members are a fraction of the total adequacy targets. The benefits received by these participants are based on the Money Purchase Annuity, payable at age 65 in the illustrations above. These participants are not eligible for the Service Retirement Formula because they have less than 5 years of service.

The analysis above assumes that short-length service participants keep their contributions at PERA until they reach age 65. From the data shown in the table below, it is clear that many participants keep their contributions in PERA, for at least a short time, allowing them to grow with the guaranteed interest rate set by PERA, currently at 3.0%, but allowed in statute to be as high as 5%. From the 1 year of data analyzed, the following percent of participants who left PERA-covered employment in 2013 chose to keep their money in PERA instead of taking an

immediate lump sum at termination. This is a benefit that offers an incentive to employees to preserve this money for retirement instead of cashing out and spending it for non-retirement needs.

### Percent of Terminations in 2013 Leaving Contributions in PERA

Division	Percent <sup>1</sup>
State	66%
Schools	74%
Local Government	62%
Judges	100%
Denver Public Schools	61%

Source: Based on PERA 2013 data as summarized by Gabriel, Roeder, Smith & Company.

<sup>1</sup> This only shows 1 year of data and could represent contributions left in for a short time.

Approximately 30%, or 3,500 of the 11,600 members who left as terminated vested members in 2013, took their funds out of the retirement system when they terminated (thereby losing that 100% employer contribution match). Additional analysis is provided below showing the termination income if the employees take out their contributions.

### TERMINATION INCOME FOR SHORT SERVICE PERA MEMBERS

As discussed previously, the policy for retirement income is based on the concept that a member who does not have a full career at PERA will receive a portion of his or her retirement income from each employer. Thus, terminating members should receive a benefit that is only a portion of their retirement benefit. There are no known objective standards for “adequacy” of benefits for terminated vested members.

Private sector employers went through significant changes back in the 1970’s and 1980’s over this issue. Employees would terminate employment and their vested benefit would remain with their employer. That benefit was frozen and had no ability to retain value over the years as that former employee moved toward retirement. Thus, “portability” became a key issue because it allowed members to obtain their funds, invest those funds, and let those monies retain some value over time. Having access to the funds was not the primary driver of that issue; rather, it was allowing the member to control the funds in order for the benefit to retain some value.

A member who terminates from the PERA Hybrid Plan with at least 5 years of service may obtain a distribution with an additional 50% employer match (and presumably invest those funds so they can retain some value) or the member may choose to leave his or her account balance at PERA and receive those funds and the 100% employer match at his or her ultimate retirement date. Participants who terminate with less than 5 years of service are not vested. The benefit they are eligible for immediately is a lump sum refund of their contributions, with interest, with no employer match. Alternatively, they can leave their contributions in PERA until they reach retirement age, receive a 100% employer match to their accumulated contributions, take it as an immediate lump sum or receive it as a Money Purchase Annuity. The tables below show the

benefits that would be payable to sample PERA employees at date of termination after working 10, 7 and 3 years, compared to the amount that could be taken if left at PERA until age 65.

10 Years of Service								
Hire Age	Salary at Date of Hire	Age at Termination	Lump Sum Payable at Termination, including the employer match on employee contributions			Lump Sum Payable at Age 65 (option to convert to monthly annuity)		
			Employee Contributions with Interest	50% Employer Match	Total	Employee Contributions with Interest	100% Employer Match	Total
25	\$25,000	35	\$31,400	\$15,700	\$47,100	\$76,200	\$76,200	\$152,400
40	\$45,000	50	\$51,400	\$25,700	\$77,100	\$80,100	\$80,100	\$160,200

Source: Gabriel, Roeder, Smith & Company.

The 25 or 40 year olds who terminate with 10 years of service can more than double or triple their lump sum benefit by leaving the money with PERA until they reach retirement eligibility. This is due to the 3% guaranteed rate of the return and the additional employer match at retirement eligibility.

7 Years of Service								
Hire Age	Salary at Date of Hire	Age at Termination	Lump Sum Payable at Termination, including the employer match on employee contributions			Lump Sum Payable at Age 65 (option to convert to monthly annuity)		
			Employee Contributions with Interest	50% Employer Match	Total	Employee Contributions with Interest	100% Employer Match	Total
25	\$25,000	32	\$19,000	\$9,500	\$28,500	\$50,400	\$50,400	\$100,800
40	\$45,000	47	\$32,000	\$16,000	\$48,000	\$54,600	\$54,600	\$109,200
55	\$55,000	62	\$37,900	\$37,900 <sup>1</sup>	\$75,800	\$41,400	\$41,400	\$82,800

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> Employer match is 100% since the member is eligible for early retirement.

These members can increase their lump sum benefit by waiting to receive their benefits.

3 Years of Service								
Hire Age	Salary at Date of Hire	Age at Termination	Lump Sum Payable at Termination, including the employer match on employee contributions			Lump Sum Payable at Age 65 (option to convert to monthly annuity)		
			Employee Contributions with Interest	0% Employer Match	Total	Employee Contributions with Interest	100% Employer Match	Total
25	\$25,000	28	\$6,700	\$0	\$6,700	\$19,900	\$19,900	\$39,800
40	\$45,000	43	\$11,700	\$0	\$11,700	\$22,500	\$22,500	\$45,000
55	\$55,000	58	\$14,200	\$0	\$14,200	\$17,400	\$17,400	\$34,800

Source: Gabriel, Roeder, Smith & Company.

These very short service members can significantly increase the lump sum amount (the 25 year old increases nearly 6-fold) by waiting to receive their benefits until they reach retirement eligibility. This is due to the 3% guaranteed rate of return and the fact that by waiting they go from receiving no employer match to ultimately receiving a 100% employer match.

## Assumptions:

- 3% assumed interest credited to employee contributions to age 65
- Salaries are increased based on the assumptions in the *December 31, 2013, Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado*. For example, these salary increase assumptions range from 7.65% at age 25 to 3.90% at age 65 (State Division).

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## **SECTION V**

COMPARISON OF BENEFITS AND  
CONTRIBUTIONS OF CURRENT PLAN  
DESIGN TO ALTERNATIVE PLAN DESIGNS-NEW  
HIRE BASIS

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## SECTION V

### COMPARISON OF BENEFITS AND CONTRIBUTIONS OF CURRENT PLAN DESIGN TO ALTERNATIVE PLAN DESIGNS-NEW HIRE BASIS

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The purpose of this section is to compare benefits, cost, and portability of benefits of the PERA Hybrid Plan to alternative plan designs and to illustrate the impact that a change from the current plan design to alternative designs would have on expected retirement benefits for future retirees. The analysis provided here does not include any changes to benefits for current retirees or active members and only addresses the impact of alternative plans for new hires.

#### KEY FINDINGS

*When holding costs (for new hires) constant and solving for the benefit formula that could be delivered for those costs, the PERA Hybrid Plan provides the highest amount of benefits for the given cost.*

*Social Security is an “inefficient” plan, providing benefits at a high cost.*

*When holding benefits constant, the PERA Hybrid Plan provides those benefits at the lower cost. Thus, this study could find no plan that provides a more effective level of benefits than the PERA Hybrid Plan. A major reason for this is that the cost of benefits under the PERA Hybrid Plan for new hires is low; for the State Division it is 8.82%. (Social Security is 12.40%).*

*The portability that comes with the Cash Balance Plan adds to the extra expense of that benefit structure.*

*Individually directed defined contribution plans do not earn investment returns to the same degree as large, professionally managed defined benefit plans.*

#### METHODOLOGY

To measure the effectiveness of the PERA Hybrid Plan compared to alternative plans, we looked at it from two perspectives.

- **Targeted Benefit Approach** - First, we set all the benefit levels (replacement ratios) under all plans equal to the benefit level (replacement ratio) under the PERA Hybrid Plan and then estimated the costs, or contribution amounts, needed to provide those benefits under each alternative benefit structure. This was done in order to determine whether there is a more effective benefit structure; one that could provide a similar benefit at a lower cost. This approach for the modeled plans targets the replacement ratio for a full career employee with 30 years of service at age 65, which is 72.2% for PERA Hybrid Plan members (75% for Judges).

- Targeted Contribution Approach.** Second, we held the costs constant under all plans and equal to the normal cost under the PERA Hybrid Plan and looked for a plan that could provide a higher level of benefits for the same cost. This approach keeps the level of contributions equal to the PERA Hybrid Plan contribution rates *for new hires*, since the alternative plans are for new hires, and lets the ultimate level of benefits vary. The cost for new hires as a percent of payroll is the cost for employees hired on or after January 1, 2011, including the plan benefit provisions summarized in Section III and excluding any assumed COLA, consistent with the actuarial valuation assumptions. These employees receive annual increases only to the extent affordable (Colorado PERA's Comprehensive Annual Financial Report (CAFR) for the year ended December 31, 2013), and therefore, the valuation assumes no COLA for these participants. This study makes the same assumption of no COLA when comparing costs of alternative plans. For example, as shown in the table below, the normal cost and targeted contribution amount for the PERA Hybrid Plan State Division new hires is 8.82%, not 26.35%. Any contributions above the new entrant cost of 8.82% go towards paying down the unfunded accrued liability.

The table below shows the current contribution rates, replacement ratios, and estimated costs for PERA Hybrid Plan new hires, as a percent of pay. The costs vary by division due to the different benefit provisions and populations.

PERA Hybrid Plan Replacement Ratio and Estimated Cost for New Hires					
Division	January 1, 2015 Contribution % of Pay <sup>1</sup>	Replacement Ratio % of Pay Target	Estimated Cost for New Hires as % of Pay Target		
	Total Member and Employer	Age 65 and 30 years of service	Employer	Member	Total Member and Employer
State	26.35%	72.2%	0.82%	8.00%	8.82%
Local Government	21.70%	72.2%	0.41%	8.00%	8.41%
Schools	26.35%	72.2%	1.49%	8.00%	9.49%
Denver Public Schools	26.35%	72.2%	2.09%	8.00%	10.09%
Judges	25.36%	75.0%	7.29%	8.00%	15.29%

Source: Information provided by PERA and summarized by Gabriel, Roeder, Smith & Company. See Appendix C for more information on the development of these costs. This estimated total normal cost (annual cost) is the cost for new hires.

<sup>1</sup> Note that PERA's contributions include 1.02% for the Health Care Trust Fund and 1% for the Annual Increase Reserve.

## PLAN DESCRIPTIONS AND REPLACEMENT RATIO ANALYSIS

This section describes the alternative plans that are used when comparing the benefits and cost to the current PERA Hybrid Plan design and examines each of the alternative plan models for the level of replacement income provided, the value offered, and the balance of risk. The alternatives described below are all plan designs in use in the public or private sector. GRS modeled alternative plans and analyzed the actuarial and fiscal impacts of those models, using a number of assumptions for the alternative plans, which are described in Appendix C. For an overview of some of the peer systems using the alternative plans, see Appendix E.



Below is a table showing the main features of each design.

Features	Current PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side	Cash Balance Plan	Self-Directed Defined Contribution Plan	Defined Benefit and Social Security – Private Sector Model I	Defined Contribution and Social Security – Private Sector Model II
Plan Type	Defined Benefit only	Defined Benefit and Defined Contribution	Defined Benefit	Defined Contribution	Defined Benefit and Social Security	Defined Contribution and Social Security
Defined Benefit	Fixed. Based on formula of a percent x service x salary, with option to take refund plus match.	Fixed. Based on formula of a percent x service x salary	Variable. Based on a formula of a percent x pay, with interest based on investment earnings	None	Fixed. Based on formula of a percent x service x salary	None
Funding for Defined Benefit	Funded by employer and employee contributions	Funded by employer contributions	Funded by employer and employee contributions	NA	Funded by employer and employee contributions	NA
Defined Contribution Benefit	NA	Variable	NA	Variable	None	Variable
Funding for Defined Contribution	NA	Funded by employee contributions	NA	Funded by employer match and employee contributions	NA	Funded by employer match and employee contributions
Investment Risk	Employer	Shared	Shared	Employee	Employer	Employee
Longevity Risk	Employer	Shared	Shared	Employee	Employer	Shared (due to Social Security)
Social Security	No	No	No	No	Yes	Yes
Portability	Money Purchase account or annuitize at 7.5%	Defined contribution account balance	Cash balance account or annuitize at 5.5%	Defined contribution account balance	None	Defined contribution account balance

Source: Information summarized by Gabriel, Roeder, Smith & Company.

In the following sections, we compare the PERA Hybrid Plan State Division to the five alternative plans listed above, applying both the Targeted Benefit and Targeted Contribution Approaches. The results for the State Division are similar to the results for the other PERA divisions (Schools, Denver Public Schools, Local Government, and Judicial), which can be found in Appendix I.

For purposes of our analysis, this study uses the assumption that the defined contribution plans will earn 5.50% per year (2% less than the long term rate of return of 7.5% in the PERA Hybrid Plan). This is because in examining the projected investment performance of the alternative plans, this study concludes that:

- Members will do worse investing on their own in a plan with a defined contribution component; and
- The underperformance of alternative plans with defined contribution elements is primarily due to access to fewer asset classes, demonstrated behavioral tendencies by individuals, and higher fees.

We discuss investment performance in more detail later in this Section.

## DEFINED BENEFIT AND DEFINED CONTRIBUTION SIDE-BY-SIDE PLAN

The first alternative plan to be reviewed is the Defined Benefit and Defined Contribution Side-by-Side Plan. This type of plan provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

Comparison of Plan Features Defined Benefit and Defined Contribution Side-by-Side Plan v. PERA Hybrid Defined Benefit Plan	
Defined Benefit and Defined Contribution Side-by-Side Plan	PERA Hybrid Defined Benefit Plan
Provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are shared between the employee and employer.	Investment and longevity risks are held by the employer.
Defined benefit portion of the plan is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution portion of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a side-by-side defined benefit-defined contribution plan structure are the Georgia Employee Retirement System and Michigan Public School Employees Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
The defined benefit plan is assumed to have some degree of ancillary benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit and Defined Contribution Side-by-Side Plan in which the state contribution funds the defined benefit portion of the plan and the member contributions fund the defined contribution portion of the plan. The defined benefit portion of the plan offers a 1.50% multiplier and averages the member's 3 highest years of salary. In addition, the study assumed that the member would direct the investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

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## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

The following table compares the Defined Benefit and Defined Contribution Side-by-Side Plan to the PERA Hybrid Plan under the Targeted Benefit Approach for the State Division. The targeted benefits are all based on an age 65 retirement date. Although the current PERA Hybrid Plan members tend to retire closer to age 60, the study uses an age 65 retirement date so that comparisons can be made to private sector plans (which use Social Security and which typically require an age 65 retirement).

As the table shows, the targeted benefit amount at age 65 with 30 years of service is 72.2% of final pay, which is the PERA Hybrid Plan's replacement ratio. Thus, the targeted benefit amount under the Defined Benefit and Defined Contribution Side-by-Side Plan is also defined to be 72.2% at age 65 with 30 years of service. In order for the Defined Benefit and Defined Contribution Side-by-Side Plan to provide comparable benefits at age 65, the Defined Benefit and Defined Contribution Side-by-Side Plan will need to have a defined benefit plan multiplier of 1.50% of final average earnings and an employer contribution of 5.29% of pay. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, for the Defined Benefit and Defined Contribution Side-by-Side Plan to provide the same level of benefits as the current PERA Hybrid Plan, it would cost 60% more than the PERA Hybrid Plan costs. Replacement ratios under both plans are similar for longer term career employees and slightly higher under the Defined Benefit and Defined Contribution Side-by-Side Plan for mid-length and shorter term employees.

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach State Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				0.82%	5.29%
Member Contribution <sup>2</sup>				8.00%	9.03%
Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)				100%	160%
REPLACEMENT RATIOS (set equal at age 65 with 30 years of service)					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	72.2%
35	62	27	62	62.5%	61.0%
35	60	25	60	49.7%	50.2%
40	60	20	65	39.6%	43.3%
25	45	20	65	20.6%	32.5%
40	50	10	65	13.0%	18.0%
40	43	3	65	4.4%	2.0%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Defined benefit plan multiplier of 1.50% of final 3 year's pay; the Employer contributes 5.29% of pay. Defined Contribution Plan: Members contribute 9.03% of pay, the Employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

The following table compares the Defined Benefit and Defined Contribution Side-by-Side Plan to the PERA Hybrid Plan under the Targeted Contribution Approach for the State Division. The targeted contributions are all based on estimated normal costs, which are the annual costs for a new hire.

As the table shows, the targeted contribution amount for the Defined Benefit and Defined Contribution Side-by-Side Plan is set equal to the contribution amount under the PERA Hybrid Plan. The purpose of this analysis is to show what level of retirement benefits can be provided for the same contribution amounts currently made for the PERA Hybrid Plan. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, with the same contribution amount, the Defined Benefit and Defined Contribution Side-by-Side Plan provides a significantly lower level of benefits than the current PERA Hybrid Plan for all sample employees.

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach State Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.82%</b>	<b>5.29%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>3.53%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>54.4%</b>
35	62	27	62	<b>62.5%</b>	<b>46.5%</b>
35	60	25	60	<b>49.7%</b>	<b>37.7%</b>
40	60	20	65	<b>39.6%</b>	<b>31.3%</b>
25	45	20	65	<b>20.6%</b>	<b>20.1%</b>
40	50	10	65	<b>13.0%</b>	<b>11.7%</b>
40	43	3	65	<b>4.4%</b>	<b>0.8%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Defined benefit plan multiplier of 1.50% of final 3 year's pay; the Employer contributes 5.29% of pay. Defined Contribution Plan: Members contribute 3.53% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## CASH BALANCE PLAN

The next alternative plan to be reviewed is the Cash Balance Plan. This type of plan functions like a defined contribution plan, building a member's account balance year by year through the addition of mandated employer and employee contributions as well as the addition of a guaranteed rate of return. For this study the Nebraska Cash Balance Plan was used as a model, with the related 5.0% guaranteed rate of return. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Cash Balance Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Cash Balance Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement which may be used to purchase or convert to an annuity with the goal of providing portable benefits and adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment risk is borne by the employer, and there is an "arbitrage" between the assumed rate of return of 7.5% and the guaranteed crediting rate of 5.0%. Longevity risks are borne by the employer if the member elects to annuitize out of the plan.	Investment and longevity risks are held by the employer.
The member may elect to convert his or her account balance to a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution feature of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a cash balance plan structure include Nebraska and the Texas Municipal Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits assumed to be provided by the cash balance plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Cash Balance Plan in which the state contribution plus the guaranteed rate of return (5.0%) provides a lump sum at retirement which, when converted to an annuity will replace the 72.2% ratio of the PERA Hybrid Plan age 65 benefit. In addition, the study assumed that the employer would manage the fund and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

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## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

The following table compares the Cash Balance Plan to the PERA Hybrid Plan under the Targeted Benefit Approach for the State Division. The targeted benefits are all based on an age 65 retirement date. Although the current PERA members tend to retire closer to age 60, the study uses an age 65 retirement date so that comparisons can be made to private sector plans (which use Social Security and which typically require an age 65 retirement).

As the table shows, the targeted benefit amount at age 65 with 30 years of service is 72.2% of final pay, which is the PERA Hybrid Plan's replacement ratio. Thus, the targeted benefit amount under the Cash Balance Plan is also defined to be 72.2% at age 65 with 30 years of service. In order for the Cash Balance Plan to provide comparable benefits at age 65, the Cash Balance Plan will need to have an employee contribution of 8%, an employer contribution of 8.08% and a guaranteed rate of return for the member of 5% and actual fund earnings of 7.5%. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, for the Cash Balance Plan to provide the same level of benefits as the current PERA Hybrid Plan, it would cost 79% more than the PERA Hybrid Plan costs. Replacement ratios under both plans are similar for longer term career employees, but higher under the Cash Balance Plan for mid-length and shorter term employees.



Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach State Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				0.82%	8.08%
Member Contribution <sup>2</sup>				8.00%	8.00%
Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)				100%	179%
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	72.2%
35	62	27	62	62.5%	59.1%
35	60	25	60	49.7%	51.7%
40	60	20	65	39.6%	48.8%
25	45	20	65	20.6%	47.0%
40	50	10	65	13.0%	24.9%
40	43	3	65	4.4%	7.5%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash Balance Plan structure with a member contribution of 8%, an employer contribution of 8.08%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

The following table compares the Cash Balance Plan to the PERA Hybrid Plan using the Targeted Contribution Approach for the State Division. The targeted contributions are all based on estimated normal costs, which are the annual costs for a new hire.

As the table shows, the targeted contribution amount for the Cash Balance Plan is set equal to the contribution amount under the PERA Hybrid Plan. The purpose of this analysis is to show what level of retirement benefits can be provided for the same contribution amounts currently made for the PERA Hybrid Plan. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, with the same contribution amount, the Cash Balance Plan provides a significantly lower level of benefits than the current PERA Hybrid Plan for all sample employees.

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach State Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				0.82%	0.82%
Member Contribution <sup>2</sup>				8.00%	8.00%
Relative Cost (set equal)				100%	100%
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	26.3%
35	62	27	62	62.5%	21.6%
35	60	25	60	49.7%	18.8%
40	60	20	65	39.6%	17.8%
25	45	20	65	20.6%	17.1%
40	50	10	65	13.0%	9.1%
40	43	3	65	4.4%	2.7%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Cash Balance Plan structure with a member contribution of 8%, an employer contribution of 0.82%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## SELF-DIRECTED DEFINED CONTRIBUTION PLAN

The next alternative plan to be reviewed is the Self-Directed Defined Contribution Plan. This type of plan builds a member's account balance year-by-year through the addition of employee contributions with an employer match and grows with actual investment returns. The member does not participate in Social Security. Colorado PERA Defined Contribution Plan is an example of a system using this model. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Self-Directed Defined Contribution Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Self-Directed Defined Contribution Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement with a goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee.	Investment and longevity risks are held by the employer.
The account balance is the benefit at retirement.	Defined benefit is designed to provide a lifetime annuity.
The vested account balance is portable at time of termination.	A money purchase feature provides a portable benefit option.
A system using a self-directed defined contribution plan structure is Colorado PERA- for those members who elect into PERAChoice.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Self-Directed Defined Contribution Plan and assumed that the employee would direct their investments and earn an annual 5.5% rate of return, and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

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## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

The following table compares the Self-Directed Defined Contribution Plan to the PERA Hybrid Plan using the Targeted Benefit Approach for the State Division. The targeted benefits are all based on an age 65 retirement date. Although the current PERA members tend to retire closer to age 60, the study uses an age 65 retirement date so that comparisons can be made to private sector plans (which use Social Security and which typically require an age 65 retirement).

As the table shows, the targeted benefit amount at age 65 with 30 years of service is 72.2% of final pay, which is the PERA Hybrid Plan's replacement ratio. Thus, the targeted benefit amount under the Self-Directed Defined Contribution Plan is also defined to be 72.2% at age 65 with 30 years of service. In order for the Self-Directed Defined Contribution Plan to provide comparable benefits at age 65, the Self-Directed Defined Contribution Plan will need to have an employee contribution of 8%, a State contribution of 13.87%, and actual fund earnings of 5.5%. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, for the Self-Directed Defined Contribution Plan to provide the same level of benefits as the current PERA Hybrid Plan, it would cost 142% more than the PERA Plan costs. Replacement ratios under both plans are similar for longer term career employees, but higher under the Self-Directed Defined Contribution Plan for mid-length and shorter term employees.

Comparison of Self-Directed Defined Contribution Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach State Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.82%</b>	<b>13.87%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>242%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.7%</b>
35	60	25	60	<b>49.7%</b>	<b>51.0%</b>
40	60	20	65	<b>39.6%</b>	<b>48.8%</b>
25	45	20	65	<b>20.6%</b>	<b>50.4%</b>
40	50	10	65	<b>13.0%</b>	<b>25.5%</b>
40	43	3	65	<b>4.4%</b>	<b>7.8%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Self-Directed Defined Contribution plan structure with a member contribution of 8%, an employer contribution of 13.87%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

The following table compares the Self-Directed Defined Contribution Plan to the PERA Hybrid Plan using the Targeted Contribution Approach for the State Division. The targeted contributions are all based on estimated normal costs, which are the annual costs for a new hire.

As the table shows, the targeted contribution amount for the Self-Directed Defined Contribution Plan is set equal to the contribution amount under the PERA Hybrid Plan. The purpose of this analysis is to show what level of retirement benefits can be provided for the same contribution amounts currently made for the PERA Hybrid Plan. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, with the same contribution amount, the Self-Directed Defined Contribution Plan provides a significantly lower level of benefits than the current PERA Hybrid Plan for all sample employees.

Comparison of Self-Directed Defined Contribution Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach State Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.82%</b>	<b>0.82%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>28.3%</b>
35	62	27	62	<b>62.5%</b>	<b>23.0%</b>
35	60	25	60	<b>49.7%</b>	<b>20.0%</b>
40	60	20	65	<b>39.6%</b>	<b>19.1%</b>
25	45	20	65	<b>20.6%</b>	<b>19.7%</b>
40	50	10	65	<b>13.0%</b>	<b>10.0%</b>
40	43	3	65	<b>4.4%</b>	<b>3.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 0.82%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## DEFINED BENEFIT AND SOCIAL SECURITY; “PRIVATE SECTOR”

The next alternative plan to be reviewed is the Defined Benefit and Social Security Plan. This plan is very common in the public sector since most statewide plans are defined benefit plans, and all but seven states participate in Social Security. Although rarer, this combination of plans can also be found in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most newer retirees) and have modified the defined benefit plan to meet the targets under the study.

Comparison of Plan Features Defined Benefit Plan and Social Security v. PERA Hybrid Defined Benefit Plan	
Defined Benefit Plan and Social Security	PERA Hybrid Defined Benefit Plan
Provides a defined benefit with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risk are held by the employer in the defined benefit plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risk are held by the employer.
Defined benefit is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
A deferred benefit for a vested terminated member may be available at retirement age; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Nearly all public sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees
Both Social Security and the defined benefit plan provide death and disability benefits.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit Plan and Social Security Plan in which the state and the member would contribute to Social Security, and, in addition, the State would contribute to a defined benefit plan.

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## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at age 65

The following table compares the Defined Benefit and Social Security Plan to the PERA Hybrid Plan using the Targeted Benefit Approach for the State Division. The targeted benefits are all based on an age 65 retirement date. Although the current PERA members tend to retire closer to age 60, the study uses an age 65 retirement date so that comparisons can be made to private sector plans (which use Social Security and which typically require an age 65 retirement).

As the table shows, the targeted benefit amount at age 65 with 30 years of service is 72.2% of final pay, which is the PERA Hybrid Plan's replacement ratio. Thus, the targeted benefit amount under the Defined Benefit and Social Security Plan is also defined to be 72.2% at age 65 with 30 years of service. In order for the Defined Benefit and Social Security Plan to provide comparable benefits at age 65 the Defined Benefit and Social Security Plan will need to have the employer contribution to Social Security equal 6.2% of pay and an additional defined benefit plan contribution for a total employer contribution of 10.26% of pay. Members will contribute 6.2% of pay to Social Security. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, for the Defined Benefit and Social Security Plan to provide the same level of benefits as the current PERA Hybrid Plan, it would cost 83% more than the PERA Plan costs. Replacement ratios under both plans are similar for longer term career employees, but lower under the Defined Benefit and Social Security Plan for mid-length and shorter term employees, partially because for termination ages less than age 62, the Social Security replacement ratio is shown as 0%.



Comparison of Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach State Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				0.82%	10.26%
Member Contribution <sup>2</sup>				8.00%	6.20%
Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)				100%	183%
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	72.2%
35	62	27	62	62.5%	59.8%
35	60	25	60	49.7%	22.9%
40	60	20	65	39.6%	18.2%
25	45	20	65	20.6%	9.5%
40	50	10	65	13.0%	6.0%
40	43	3	65	4.4%	1.3%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Social Security participation and an additional Defined Benefit Plan with a 1.15% multiplier. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

The following table compares the Defined Benefit and Social Security Plan to the PERA Hybrid Plan using the Targeted Contribution Approach for the State Division. The targeted contributions are all based on estimated normal costs, which are the annual costs for a new hire, and the federally mandated Social Security contributions of 6.2% of pay for both employees and the employer.

As the table shows, the targeted contribution amount for the Defined Benefit and Social Security Plan exceeds the contribution amount under the PERA Hybrid plan. Since Social Security costs more than the current plan structure (12.4% vs. 8.82%), the relative costs cannot be set equal to the PERA Hybrid Plan costs. This means that the alternative plan in this case is solely Social Security. The purpose of this analysis is to show what level of retirement benefits can be provided for the higher contribution amount. The table also compares replacement ratios under

both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, the Defined Benefit and Social Security Plan provides a significantly lower level of benefits than the current PERA Hybrid Plan for all sample employees, primarily because Social Security is the only benefit provided in this scenario and also because for termination ages less than age 62, the Social Security replacement ratio is shown as 0%.

Comparison of Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach State Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.82%</b>	<b>6.20%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (not possible to set equal)</b>				<b>100%</b>	<b>139%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>39.0%</b>
35	62	27	62	<b>62.5%</b>	<b>31.0%</b>
35	60	25	60	<b>49.7%</b>	<b>0.0%</b>
40	60	20	65	<b>39.6%</b>	<b>0.0%</b>
25	45	20	65	<b>20.6%</b>	<b>0.0%</b>
40	50	10	65	<b>13.0%</b>	<b>0.0%</b>
40	43	3	65	<b>4.4%</b>	<b>0.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Social Security only. Social Security is 139% more expensive than PERA so moving to Social Security will raise costs 39% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit Plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## DEFINED CONTRIBUTION AND SOCIAL SECURITY; “PRIVATE SECTOR”

The next alternative plan to be reviewed is the Defined Contribution and Social Security Plan. This plan is very common in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most new retirees) and have modified the defined contribution plan to meet the targets under the study.

Comparison of Plan Features Defined Contribution Plan and Social Security v. PERA Hybrid Defined Benefit Plan	
Defined Contribution Plan and Social Security	PERA Hybrid Defined Benefit Plan
Provides a defined contribution account balance at retirement and a life annuity from Social Security with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee in the defined contribution plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risks are held by the employer.
Defined contribution is designed to provide an account balance at retirement. Social Security is designed to provide a lifetime annuity at retirement.	Defined benefit is designed to provide a lifetime annuity.
The defined contribution balance would be portable at termination; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Many private sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
Social Security provides death and disability benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Contribution and Social Security Plan in which the state and the member would contribute to Social Security, and, in addition, the member and State would contribute to a defined contribution plan.

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## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

The following table compares the Defined Contribution and Social Security Plan to the PERA Hybrid Plan using the Targeted Benefit Approach for the State Division. The targeted benefits are all based on an age 65 retirement date. Although the current PERA members tend to retire closer to age 60, the study uses an age 65 retirement date so that comparisons can be made to private sector plans (which use Social Security and which typically require an age 65 retirement).

As the table shows, the targeted benefit amount at age 65 with 30 years of service is 72.2% of final pay, which is the PERA Hybrid Plan's replacement ratio. Thus, the targeted benefit amount under the Defined Contribution and Social Security Plan is also defined to be 72.2% at age 65 with 30 years of service. In order for the Defined Contribution and Social Security Plan to provide comparable benefits at age 65 the Defined Contribution and Social Security Plan will need to have employer and employee contributions to Social Security and additional employer and employee contributions to the defined contribution plan. Members and the employer will contribute 6.2% of pay to Social Security. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, for the Defined Contribution and Social Security Plan to provide the same level of benefits as the current PERA Hybrid Plan, it would cost 150% more than the PERA Plan costs. Replacement ratios under both plans are similar for longer term career employees, but lower under the Defined Contribution and Social Security Plan for mid-length and shorter term employees, partially because for termination ages less than age 62, the Social Security replacement ratio is shown as 0%.

Comparison of Defined Contribution and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach State Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.82%</b>	<b>11.14%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>11.45%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>250%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.1%</b>
35	60	25	60	<b>49.7%</b>	<b>23.6%</b>
40	60	20	65	<b>39.6%</b>	<b>22.5%</b>
25	45	20	65	<b>20.6%</b>	<b>23.2%</b>
40	50	10	65	<b>13.0%</b>	<b>11.8%</b>
40	43	3	65	<b>4.4%</b>	<b>3.6%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Social Security participation and an additional Defined Contribution Plan with a 4.94% employer contribution, a 5.25% member contribution, earnings of 5.5% per year, and an annuity conversion at retirement based on 5.5% and the valuation mortality table. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## State Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

The following table compares the Defined Contribution and Social Security Plan to the PERA Hybrid Defined Benefit Plan using the Targeted Contribution Approach for the State Division. The targeted contributions are all based on estimated normal costs (annual costs for a new entrant) and the federally mandated Social Security contributions of 6.2% of pay for both employees and the employer.

As the table shows, the targeted contribution amount for the Defined Contribution and Social Security Plan exceeds the contribution amount under the PERA Hybrid Plan. Since Social Security costs more than the current plan structure (12.4% vs. 8.82%), the relative costs cannot be set equal to the PERA Hybrid Plan costs. This means that the alternative plan in this case is solely Social Security. The purpose of this analysis is to show what level of retirement benefits can be provided for the higher contribution amount. Based on that given plan design, the replacement

ratios are then illustrated for each hire, termination and commencement age combination. The table also compares replacement ratios under both plans for a sample of employees with varying years of service and ages at hire, termination, and benefit commencement to show how different employees would fare under the two plans.

As the table shows, the Defined Contribution and Social Security Plan provides a significantly lower level of benefits than the current PERA Hybrid Plan for all sample employees, primarily because Social Security is the only benefit provided in this scenario and also because for termination ages less than age 62, the Social Security replacement ratio is shown as 0%.

Comparison of Defined Contribution and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach State Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				0.82%	6.20%
Member Contribution <sup>2</sup>				8.00%	6.20%
Relative Cost (not possible to set equal)				100%	139%
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	39.0%
35	62	27	62	62.5%	31.0%
35	60	25	60	49.7%	0.0%
40	60	20	65	39.6%	0.0%
25	45	20	65	20.6%	0.0%
40	50	10	65	13.0%	0.0%
40	43	3	65	4.4%	0.0%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> <b>Features of the Alternative Plan:</b> Social Security only. Social Security is 139% more expensive than PERA so moving to Social Security will raise costs 39% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit Plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

**SUMMARY OF FINDINGS – TARGETED BENEFIT APPROACH**

*The study finds that the existing PERA Hybrid Plan provides the current level of benefits at a lower cost than all alternative plans. Therefore, if the State desires to provide the same level of benefits under an alternative plan, then higher contribution rates would be necessary.*

The previous charts demonstrate this finding for the State Division and Appendix I shows similar results for all of the other divisions in PERA. The cost of the current PERA Hybrid Plan is set at 100 (not including the cost to amortize any unfunded liability). The targeted benefit approach measures the relative cost of the alternative plans assuming the goal is to provide the same benefit level to a career employee as provided under the current plan.

One of the features of the traditional defined benefit plan is that it maximizes income to career employees over short-term employees. Defined contribution plans, on the other hand, provide an even income to all employees over the course of their employment. A hybrid plan, like PERA, creates a balance between these two. Replacement ratio and cost across the structures show the difference in value between the plan designs.

Other items to note:

- The Targeted Benefit Approach is designed so that all of the structures create a replacement ratio at age 65 and 30 years of service equal to 72.2% (75% for Judges).
- The relative cost always refers back to the current PERA benefit structure. So the 242% relative cost on a self-directed defined contribution plan means that it costs 142% more across all members to provide the same benefit at retirement to career employees, if all assumptions are met.
- These results include Social Security benefits for the two private sector alternative plans.

Following are tables and graphs showing summary results for the State Division. Results for all other divisions may be found in Appendix I.

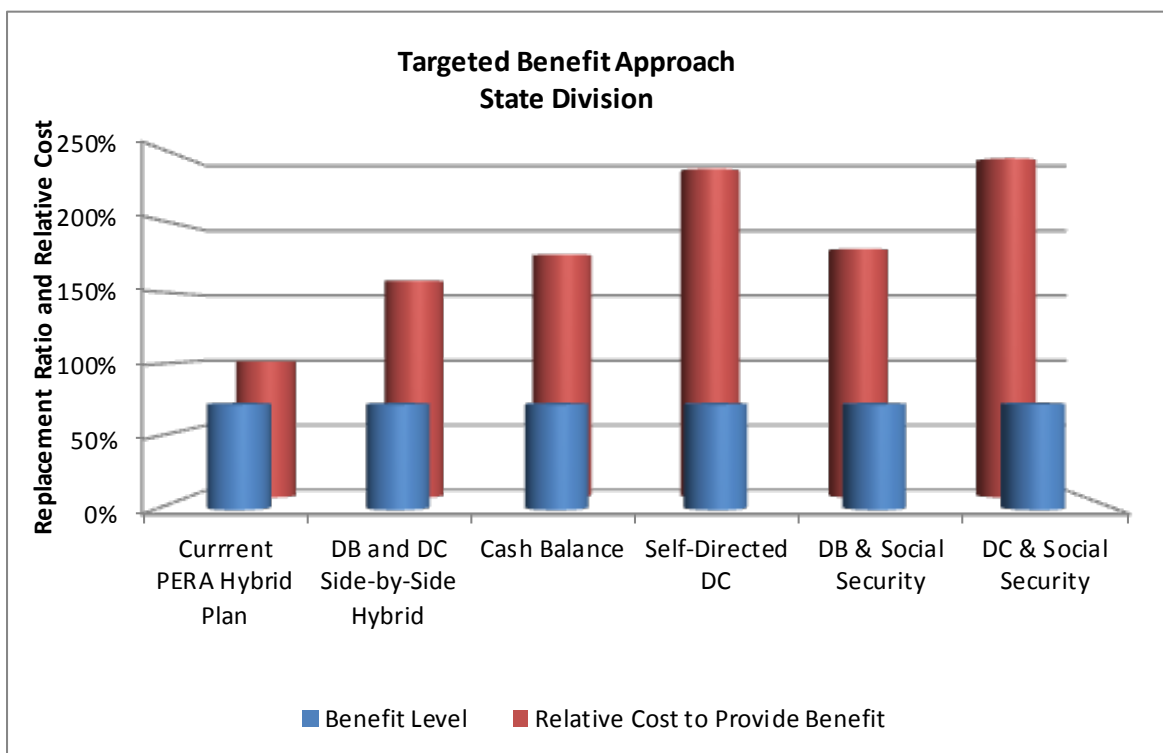
**State Division:** *The relative costs for the alternative plans range from 160% to 250%, with the Defined Contribution and Social Security plans costing the most to provide the same level of benefits as the PERA Hybrid Plan.*

Comparison of Alternative Plans with PERA New Hires						
Targeted Benefit Approach State Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost	Replacement Ratio at Age Target		
				60	62	65
Current PERA Hybrid Plan	0.82%	8.00%	100%	49.7%	62.5%	72.2%
Defined Benefit and Defined Contribution Side by Side Plan	5.29%	9.03%	160%	50.2%	61.0%	72.2%
Cash Balance Plan	8.08%	8.00%	179%	51.7%	59.1%	72.2%
Self-Directed Defined Contribution Plan	13.87%	8.00%	242%	51.0%	58.7%	72.2%
Defined Benefit and Social Security	10.26%	6.20%	183%	22.9% <sup>1</sup>	59.8%	72.2%
Defined Contribution and Social Security	11.14%	11.45%	250%	23.6% <sup>1</sup>	58.1%	72.2%

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> Does not include Social Security benefits since not eligible at age 60.

The blue cylinders in the following figure are the same height, which means the benefits are at the same level for each of the plans. The higher red cylinders show that for the same benefits as the current PERA Hybrid Plan, costs will increase in the alternative plans.



Source: Gabriel, Roeder, Smith & Company.



**SUMMARY OF FINDINGS - TARGETED CONTRIBUTION APPROACH**

*The study finds that the existing PERA Hybrid Plan provides a higher level of benefit at the current cost than all alternative plans. Therefore, if the State desires to keep the costs the same under an alternative plan, then benefits would need to be reduced.*

The previous charts demonstrate this finding for the State Division and Appendix I shows similar results for all of the other divisions in PERA. The cost of each plan is held equal to the cost of the current PERA Hybrid Plans (not including the cost to amortize any unfunded liability) and the resulting replacement ratios are allowed to vary.

The relative cost of the alternative plans is kept at 100% for all alternative plans except the two models that incorporate Social Security. The relative cost for the Defined Benefit and Social Security model and the Defined Contribution and Social Security model have a relative cost that could not be kept at 100% because Social Security already costs more than PERA (except for Judges). They show a relative cost varying from 122% to 146% for all PERA divisions except for Judges. This is because the cost of Social Security is 12.4%, even without adding in a defined benefit or defined contribution component. This is greater than the cost of the current PERA Hybrid Plan for new entrants for these divisions which vary from 8.41% to 10.09% (see chart earlier in this section). Judges have a higher cost for new entrants so that the relative cost could be kept at 100% for all of the alternative plans, as can be seen in Appendix I.

Other items to note:

- The Targeted Contribution Approach is designed so that costs under all plan designs are equal to the costs for the current PERA Hybrid Plan, except when Social Security exceeds current costs.
- The cost of Social Security alone exceeds the cost for new entrants into the State, Local Government, Schools, and Denver Public Schools Divisions.

Following are tables and graphs showing summary results for the State Division. Results for all other divisions may be found in Appendix I.

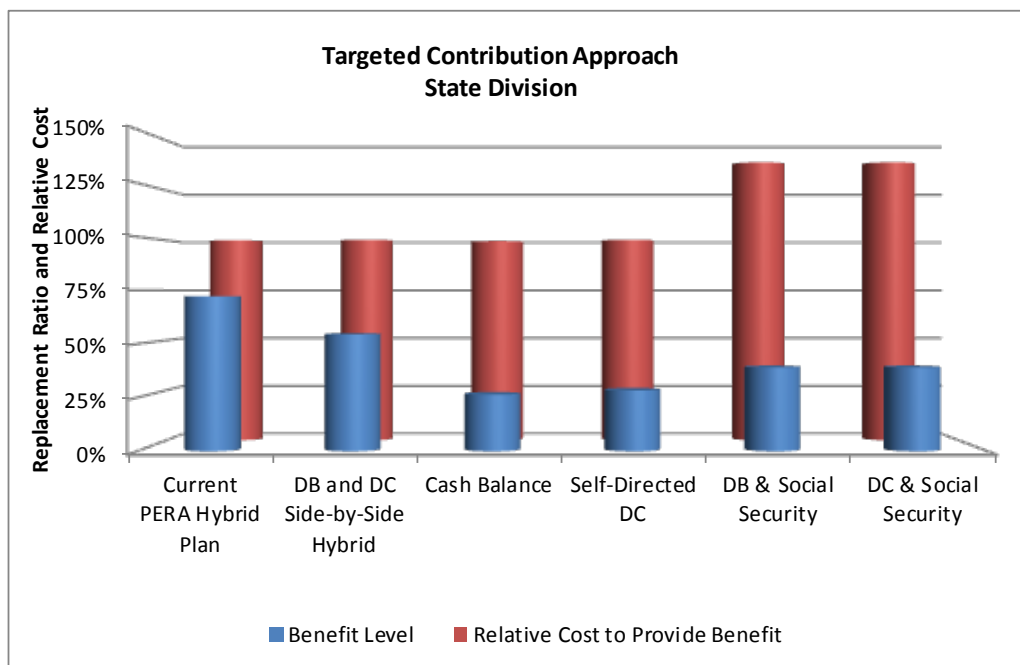
Comparison of Alternative Plans with PERA New Hires						
Targeted Contribution Approach State Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost Target	Replacement Ratio at Age		
				60	62	65
<b>Current PERA Hybrid Plan</b>	<b>0.82%</b>	<b>8.00%</b>	<b>100%</b>	<b>49.7%</b>	<b>62.5%</b>	<b>72.2%</b>
<b>Defined Benefit and Defined Contribution Side by Side Plan</b>	<b>5.29%</b>	<b>3.53%</b>	<b>100%</b>	<b>37.7%</b>	<b>46.5%</b>	<b>54.4%</b>
<b>Cash Balance Plan</b>	<b>0.82%</b>	<b>8.00%</b>	<b>100%</b>	<b>18.8%</b>	<b>21.6%</b>	<b>26.3%</b>
<b>Self-Directed Defined Contribution Plan</b>	<b>0.82%</b>	<b>8.00%</b>	<b>100%</b>	<b>20.0%</b>	<b>23.0%</b>	<b>28.3%</b>
<b>Defined Benefit and Social Security</b>	<b>6.20%</b>	<b>6.20%</b>	<b>139%<sup>1</sup></b>	<b>0.0%<sup>2</sup></b>	<b>31.0%</b>	<b>39.0%</b>
<b>Defined Contribution and Social Security</b>	<b>6.20%</b>	<b>6.20%</b>	<b>139%<sup>1</sup></b>	<b>0.0%<sup>2</sup></b>	<b>31.0%</b>	<b>39.0%</b>

Source: Gabriel, Roeder, Smith & Company

<sup>1</sup> The cost for Social Security (12.40%) exceeds the current PERA cost of 8.82%. Thus the 139% represents the cost of having Social Security as the sole retirement plan.

<sup>2</sup> Does not include Social Security benefits since not eligible at age 60.

The red cylinders in the following figure are the same height, which means the costs are at the same level for each of the plans, except for the scenarios with Social Security since Social Security costs more than PERA. The lower blue cylinders show that for the same costs as the current PERA Hybrid Plan, benefits must be reduced in the alternative plans.



Source: Gabriel, Roeder, Smith & Company

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**RETURN ASSUMPTIONS FOR THE DEFINED CONTRIBUTION PLAN COMPARISONS**

When comparing defined benefit plans, the comparison of benefits is independent of the rate of return (the costs are impacted by the earnings of the trust, but the benefits remain unchanged). Now we are adding to the comparison the benefits that may be provided from a defined contribution plan, and the benefit to be provided depends on the investment earnings in the defined contribution plan.

When defined contribution plans are added to the retirement plan structure, ultimate benefits may vary based on the investment return earned in those plans. Appendix B provides sensitivity analysis of the investment experience for the alternative plans. The defined contribution investment returns are varied showing results at 4.5% and 6.5%, which are 1% lower and 1% higher, respectively, than the 5.5% assumption used in this section.

**Defined contribution compared to defined benefit plan investment returns**

Defined contribution plans do not have the same returns as defined benefit plans. The Center for Retirement Research has found that, historically, at the plan level (meaning, ignoring individual selection differences in a defined contribution plan), defined benefit plans have outperformed defined contribution plans by 1%. (Investment returns; Defined Benefit vs. 401(k) Plans, Center for Retirement Research, An issue in Brief; Center for Retirement Research at Boston College; Alicia H. Munnell, Mauricio Soto, Jerilyn Libby, and John Prinzivalli.)

In addition, larger defined benefit plans have historically performed better than smaller ones. The commonly understood explanation is that larger plans can hire better consultants and money managers, spread fees over a larger base, and have access to a greater variety of investment vehicles.

**Lower returns in the defined contribution plan**

Another possible explanation for the lower defined contribution plan returns is the investment fees. These fees are usually assessed as a percentage of investment assets and are paid by the employee since these fees are deducted from the returns. The structure for assessing fees differs from defined benefit plans to defined contribution plans. In the above Center for Retirement Research paper, the authors conclude “it is probably reasonable to assume that fees reduce the gross return on 401(k) plans by about one percentage point.” For a long term investor, a 30-year period of a 1% lower return compounds to a 34.8% lower portfolio value.

The other factor contributing to lower returns in the defined contribution plan is that of the individual investor. (From the paper entitled “The Behavior of Individual Investors,” University of California, Davis; Brad M. Barger Graduate School of Management; Terrance Odean; Haas School of Business, University of California, Berkeley; September 2011.)

A number of behavioral influences were studied that affect the outcome of an individual investor's portfolio. The factors are sometimes termed "the emotional cost of investing" and they include a number of considerations. The paper was based on research for individual investment decision making for investing in individual stocks (rather than the mutual fund investing more commonly found in defined contribution plans); however, the concepts may still apply to individual investing in defined contribution plans.

### **Individual investor effects**

The most widely replicated observation is the "disposition effect" where individual investors sell winning investments while holding on to their losing investments. In addition, most individual investors hold under-diversified portfolios.

This same study did find that exceptional mutual funds do exist (with strong before-fee returns), but the returns are not sufficient to cover the fees charged by the funds. Financial markets are often termed a "zero sum game" where the gains of one group must be offset by the losses of others. When individual investors in defined contribution plans are pitted against corporate investors they face a risk of coming out on the wrong side of the "adding up" constraint of the market. This paper concludes that individual investors are subpar investors.

The average performance of individual investors is poor, and the biggest part of the performance penalty can be traced to transaction costs and fees.

To better assess the impact of defined contribution/individual plan investing, the anticipated benefits are also a function of the education, time, and access to information of the individual investor. To compare a defined contribution plan to a defined benefit plan on an "average investor" basis would be misleading to policy makers since a very large part of the individual investor population will have benefits significantly less than other employees as the lower rates of return earned are compounded over an entire career.

An example of how individuals who invest on their own generate lower returns is the experience of the Federal Thrift Plan. In 1986, an investment program was created for U.S. federal government employees. The options offered, the options selected, and the implementation used is instructive. Based on its most recent report, nearly 50% of invested money is allocated to lower return investment strategies, particularly government bonds. (Based on reported assets under management in G Fund, F Fund of \$149 billion of Thrift Savings Plan's \$317 billion in aggregate; assets as of year-end 2010.)

Other options are either generic equity indices (U.S. Stocks, International Developed Market Stocks, etc.) or a series of lifestyle funds. Essentially all implementation is via passive index funds or "special" government bonds. Efforts to date to reduce the behavioral biases among individual investors, primarily by the inclusion of lifestyle funds, seem to have largely failed. The projected investment returns for their participants is currently 5.3% over the long-term.

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**Payment of Higher Fees**

Annual investment expenses for individual investors are generally higher than the expenses incurred by a pension fund with pooled assets. A recent study indicates that annual costs for defined contribution plans are equal to 0.95% as a percent of assets and for defined benefit plans are equal to 0.43% as a percent of assets (A Role for Defined Contribution Plans in the Public Sector, Issue Brief, Alicia H. Munnell et al. April 2011).

**SUMMARY**

For these reasons, we have prepared a comparison of retirement plan replacement ratios based on a defined contribution long term rate of return that is 2% lower than the assumed return in the defined benefit plan. In developing this estimated return difference of 2% we broke the reasons for the return differences into two primary pieces: (1) the “structural” piece (expenses, access to asset classes, etc.) and (2) the “individual investor” piece (the emotional cost of investing; individual preferences; an individual investor vs. a skilled professional money manager). We assigned 1% to each reason (structural and individual investor) for a total of a 2% difference from the individually directed portfolio (such as a 401(k)) to the professionally managed portfolio (such as PERA).

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## **SECTION VI**

### **COMPARISON OF CURRENT BENEFITS DESIGN TO OTHER STATEWIDE PLANS AND PRIVATE SECTOR PLANS**

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## SECTION VI

### COMPARISON OF CURRENT BENEFITS DESIGN TO OTHER STATEWIDE PLANS AND PRIVATE SECTOR PLANS

This section will compare replacement ratios for the current PERA Hybrid Plan design for new entrants with replacement ratios for other statewide plans and private sector retirement plans. As a component of comparing plan design, this section will also provide a comparison of contribution rates and funded ratios for the different plans.

#### KEY FINDINGS

##### ***Public Sector Comparison***

*When comparing benefits to the public sector peer group (as surveyed in the “Public Fund Survey of the National Association of State Retirement Administrators”), the PERA Hybrid Plan’s benefit amounts, as measured by replacement ratios, are within the norms for that group. The PERA Hybrid plan provides a replacement ratio close to the average replacement ratio provided by the public sector peer groups. Overall, this finding would suggest that the retirement benefits provided by the PERA Hybrid Plan are neither too generous nor too low when compared to other similarly situated public sector employers.*

*When comparing funded ratios and contributions rates within the public sector peer group, the PERA Hybrid Plan’s member contributions are slightly below average; employer contributions are at the average, but they are below average for plans with comparable funded ratios; and funded ratio is the lowest of the entire peer group. On an aggregate basis of all divisions combined, the PERA Hybrid Plan’s funded ratio of 61% is below the national average of 71.8% for all of the plans in the Public Fund Survey.*

##### ***Private Sector Comparison***

*When comparing the PERA Hybrid Plan to the private sector, those private sector plans that combine Social Security with a defined contribution plan do not replace as much income as PERA except for the most expensive defined contribution plan in the peer group. Those private sector plans that combine Social Security with a defined benefit plan provide a greater amount of replacement income than PERA.*

*Private sector plans provide greater lump sum benefits at termination than the current PERA Hybrid Plan; however, private sector plans do not have a comparable feature of the PERA Hybrid Plan that would allow a member to leave their funds in the plan and receive an additional employer match at retirement.*

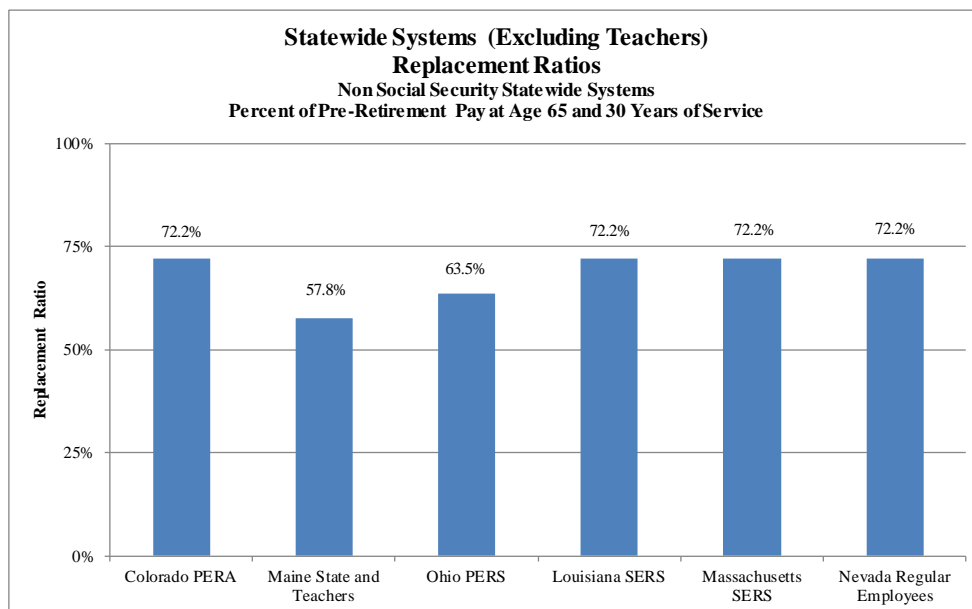
## COMPARISON TO STATEWIDE PLANS

In order to ascertain how the level of retirement benefits provided by the PERA Hybrid Plan compares to its peers, we compared PERA's replacement ratios, other benefit design features, contribution amounts, and funding levels to other statewide public pension systems with defined benefit plans that do not participate in Social Security. The results are shown for the benefit provisions that are available to new hires into the plans. The comparison breaks out the results for Teachers plans to provide a more meaningful comparison.

### Statewide Systems Peer Group

We compared the PERA Hybrid Plan to the 15 statewide public retirement systems that do not participate in Social Security and that responded to the Public Fund Survey of the National Association of State Retirement Administrators. These 15 systems include five statewide systems and 10 teacher systems.

The chart below compares the PERA Hybrid Plan's replacement ratios for a full career employee who retired at age 65 with 30 years of service to peer statewide retirement systems, assuming the most recent benefit tier is in place for the employee's entire career. For these comparisons, the assumption has been made that the final average salary is equal to final average 3 years of salary.



Source: National Association of State Retirement Administrators. Public Funds Survey for Fiscal Year 2013, as summarized by Gabriel, Roeder, Smith & Company.

<sup>1</sup> Maine State and Teachers are valued as one plan because the data could not split into state and teachers.

### Replacement Ratios (Excluding Colorado):

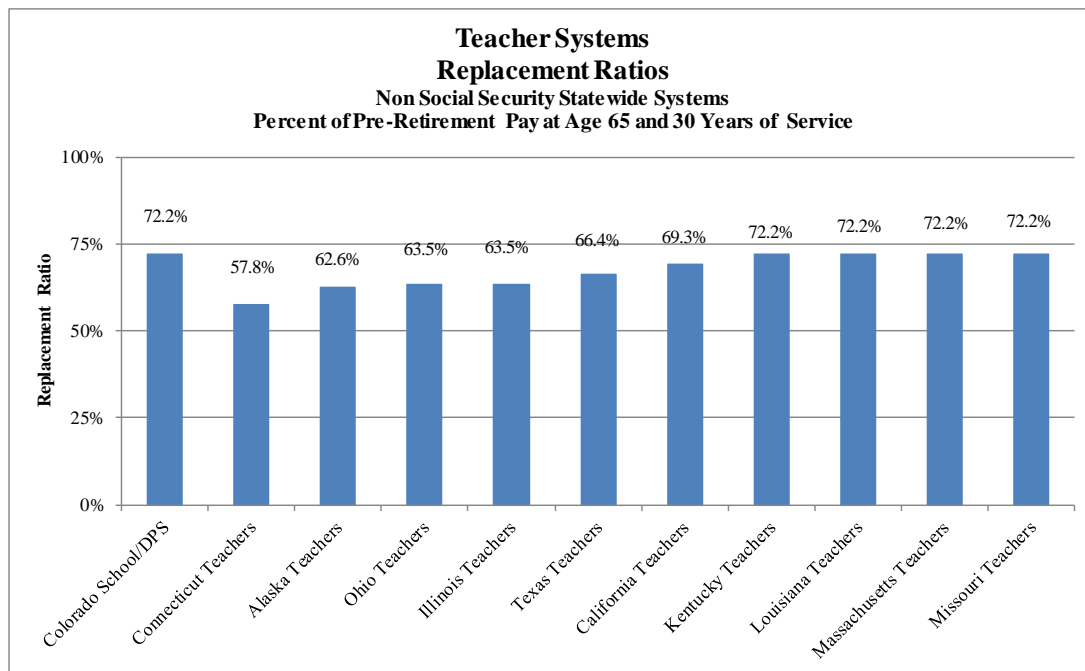
Average:	67.6%
Minimum:	57.8%
Maximum:	72.2%

1



The chart shows that the PERA Hybrid Plan's Statewide (Excluding Teachers) Divisions' replacement ratio of 72.2% for a full career employee is the most common replacement ratio among the peer states and compares to an average of 67.6%.

The chart below compares PERA replacement ratios for a full career employee in the PERA Hybrid Plan's Schools and Denver Public Schools (DPS) Divisions to peer teacher retirement systems, assuming the most recent benefit tier is in place for the employee's entire career. For these comparisons, the assumption has been made that the final average salary is equal to final average 3 years of salary.



Source: National Association of State Retirement Administrators. Public Funds Survey for Fiscal Year 2013, as summarized by Gabriel, Roeder, Smith & Company.

#### *Replacement Ratios (Excluding Colorado):*

Average:	67.2%
Minimum:	57.8%
Maximum:	72.2%

The chart above shows that the PERA Hybrid Plan's Schools and Denver Public Schools Divisions' replacement ratio of 72.2% for a full career employee is the most common replacement ratio among the peer states and compares to an average of 67.2%.

#### **Other Benefit Design Features**

There are many design features, such as COLAs, retiree medical benefits, and eligibilities that impact the benefit at retirement. The tables below compare benefit provisions for the PERA Hybrid Plan with the statewide peer groups. As the following table shows, compared to the statewide peer groups, the PERA Hybrid Plan has slightly higher eligibility requirements for

retirement, but a comparable benefit factor and COLA amount, although PERA's COLA is not automatic for new hires.

Statewide Systems (Excluding Teachers) Other Benefit Design Features Non Social Security Participating Statewide Systems (based on most recent tier of benefits)					
Plan Name	Normal Retirement (age/ years of service)	Benefit Factor	Early Retirement (age/year of service)	Post-Retirement Increase Provisions <sup>1</sup>	Replacement Ratio at Age 65 and 30 Years of Service
Colorado PERA	65/5, Rule of 90 (for hires on or after January 1, 2017) minimum age 60, any/35	2.50%	60/5, 55/20, 50/25	Lower of 2% or average CPI-W, limited to 10% of the funds in the Division's Annual Increase Reserve	72.2%
Louisiana SERS	60/5	2.50%	any/20	Lesser of 2% or CPI, plus up to 1% additional based on investment returns	72.2%
Massachusetts SERS	67/10, 30 years	2.5%; benefit may not exceed 80% of FAS	55/10	Automatic, based on CPI up to 3% on first \$13,000 of benefit, compounded. COLA is subject to legislative input	72.2%
Maine State	60/5, 62/5, 62/10	2.00%	any/25	COLA based on the CPI up to 3% applicable to the first \$20k of benefit	57.8%
Nevada Regular Employees	65/5, 62/10, any/30	2.5%	Participants may retire at any time	After 3 years of receiving benefits, auto 2% annually, rising gradually to 5% annually, compounded, after 14 years of receiving benefits	72.2%
Ohio PERS	60/5, 55/25, any/30	2.2% up to 30 years and 2.5% thereafter	n/a	Automatic 3%, simple	63.5%

Source: National Association of State Retirement Administrators. Public Funds Survey for Fiscal Year 2013, as summarized by Gabriel, Roeder, Smith & Company.

<sup>1</sup> The plans that have a 3% COLA are either capping the amount of benefit eligible for a COLA, or using a simple, non-compounded COLA.

For the teacher systems, the PERA Hybrid Plan has slightly higher eligibility requirements for normal retirement, but comparable provisions for early retirement, benefit factors, and COLA amounts. PERA's COLA is not automatic for new hires while many of the peers' COLAs are automatic.

Teacher Systems Other Benefit Design Features Non Social Security Participating Statewide Systems (based on most recent tier of benefits)					
Plan Name	Normal Retirement (age/years of service)	Benefit Factor	Early Retirement (age/years of service)	Post-Retirement Increase Provisions <sup>1</sup>	Replacement Ratio at Age 65 and 30 Years of Service
Colorado Schools/Denver Public Schools	65/5; Rule of 88 minimum age 58, any/35	2.50%	60/5,55/20, 50/25	Lower of 2% or average CPI-W, limited to 10% of the funds in the Division's Annual Increase Reserve	72.2%
Alaska Teachers	60/8, any/20	2% for first 20 years, 2.5% thereafter	55/8	Automatic, based on a % of the CPI depending on retiree's age, compounded	62.6%
California Teachers	60/5	2.0%, rising to 2.4% at age 63	55/5, 50/30	Automatic 2% simple; the system also maintains a "supplemental benefits maintenance account," intended to maintain a designated level of purchasing power	69.3%
Connecticut Teachers	60/20, any/35	2.0% up to 75% of final average salary	Any/25, 60/10	For members hired after July 1, 2007, COLA based on Social Security cost of living and investment performance of the fund.	57.8%
Illinois Teachers	67/10	2.2%	55/20	Lesser of 3% or half of CPI, simple	63.5%
Kentucky Teachers	60/27, 55/10	2.5% for first 30 years and 3.0% excess of 30 years	55/5	Automatic 1.5% compounded	72.2%
Louisiana Teachers	60/5	2.50%	Any/20	Ad hoc as approved by the legislature and contingent upon funding available in COLA account consisting of investment returns above actuarial assumptions	72.2%
Massachusetts Teachers	65/10, any/20	2.5%	55/10	Automatic, based on CPI up to 3% on first \$12,000 of benefit	72.2%
Missouri Teachers	60/5, any/30, Rule of 80	2.5%; 2.55% for 31 or more years of service	55/5, any/25	Automatic based on CPI, not to exceed 5%, compounded, with a lifetime cap of 80%	72.2%
Ohio Teachers	65/30	2.2% up to 30 years; for each year above 30, formula rises by 0.1% per year, beginning with 2.5% for year 31, up to 100% of final average salary	Any/30, 55/25, 60/5	Automatic 3% simple	63.5%
Texas Teachers	65/5, Rule of 80 minimum age 60	2.30%	55/5, 50/30	Ad hoc, as approved by the legislature, contingent on funding period of less than 31 years	66.4%

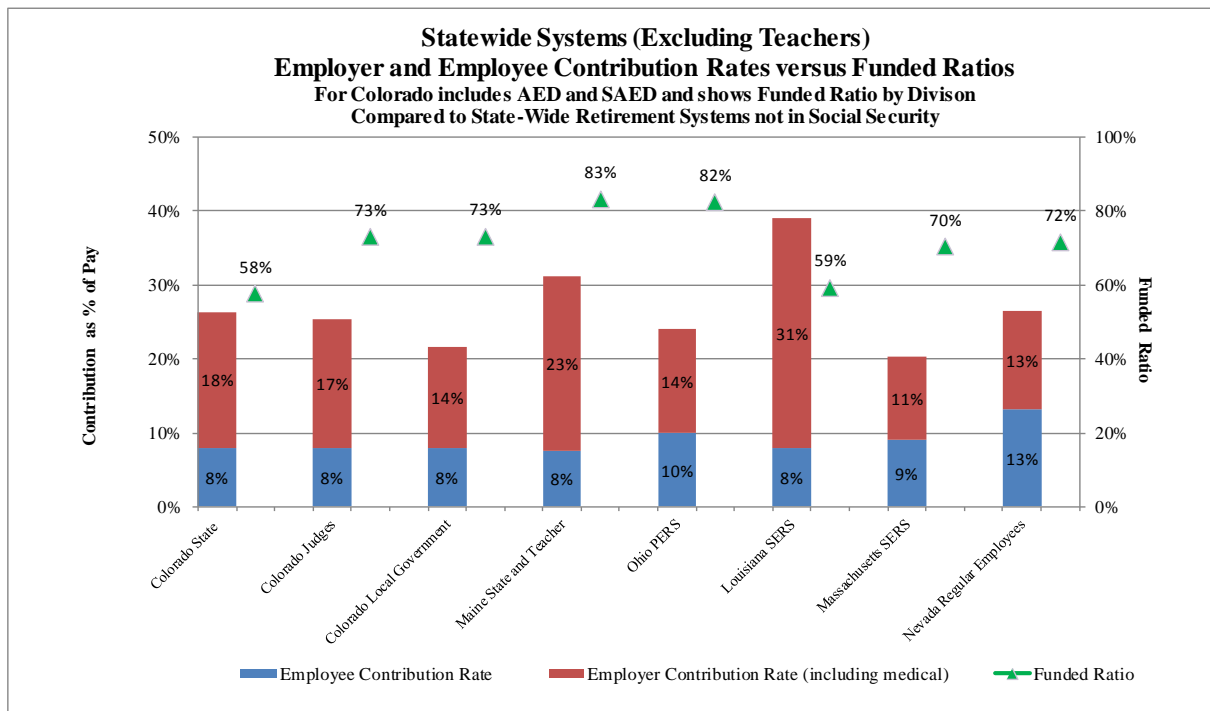
Source: National Association of State Retirement Administrators. Public Funds Survey for Fiscal Year 2013 and valuation reports, as summarized by Gabriel, Roeder, Smith & Company.

<sup>1</sup>The plans that have a 3% COLA are either capping the amount of benefit eligible for a COLA, or using a simple, non-compounded COLA, while some grant a COLA based on other contingencies.

## Contributions and Funded Ratio

Comparing benefits to the statewide peer group is only part of the picture of examining the effectiveness of a retirement program. The other part is the contribution rate, including the split between employer and employee contribution rates. Since the benefits are partially funded by employee contributions, the benefits shown above are not all employer provided benefits.

The following figures compare the PERA Hybrid Plan's contribution rates against the employer and employee contribution rates of the peer group of statewide systems that do not participate in Social Security. The comparison breaks out the results for teacher plans to provide a more meaningful comparison. The contributions shown for PERA's employer contribution include 1.02% for the Health Care Trust Fund and 1% for the Annual Increase Reserve. Survey data does not indicate if employer contributions include contributions for health care for the peer systems. The order of the systems is the same as in the benefits section to allow for a more direct comparison of the systems' benefits and contributions. The figures also show the funded ratio for each plan.



Source: National Association of State Retirement Administrators. Public Funds Survey for Fiscal Year 2013, actuarial valuation reports and Comprehensive Annual Financial Reports, as summarized by Gabriel, Roeder, Smith & Company.

### Employee Contributions (Excluding Colorado):

Average:	10%
Minimum:	8%
Maximum:	13%

As the figure shows, the employee contribution rates range from 8% to 13%. The PERA Hybrid Plan's employee contribution rate of 8.0% is the most common employee contribution rate but is below the average of 10%. One thing to note, however, is that the peer statewide plans all have automatic COLAs that are considered part of the benefit, while for the post-2006 PERA Hybrid Plan hires, the COLA is not automatic and is not included in the liabilities of the actuarial valuation of the plan. As a result, PERA's new hire costs are lower than those of a similarly situated peer with an automatic COLA.

*Employer Contributions (Excluding Colorado):*

Average:	18%
Minimum:	11%
Maximum:	31%

The PERA Hybrid Plan State Division employer contribution rate of 18% is the same as the average of 18%, the PERA Hybrid Plan Judges Division employer contribution rate of 17% is slightly below the average, and the PERA Hybrid Plan Local Government Division employer contribution rate of 14% is below the average. Note that this comparison is based on January 1, 2015 PERA Hybrid Plan contribution rates and does not take into account any projected future contribution increases. Also, note that PERA Hybrid Plan contributions include 1.02% for the Health Care Trust Fund and 1% for the Annual Increase Reserve.

*Funded Ratio (Excluding Colorado):*

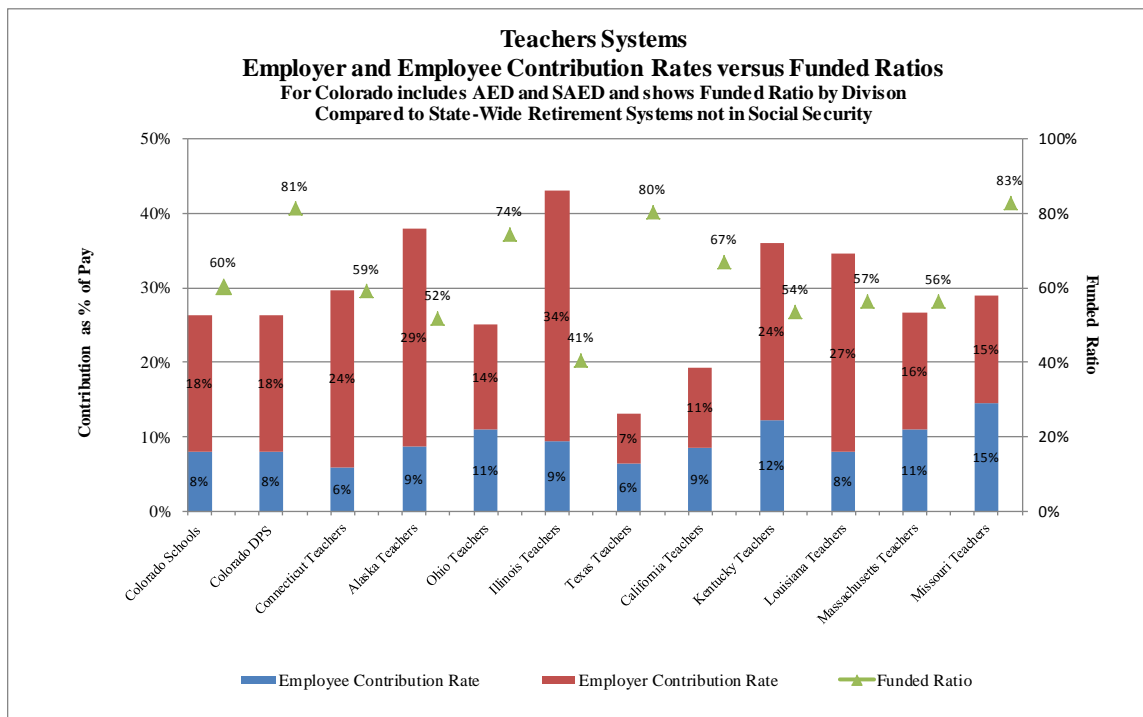
Average:	73%
Minimum:	59%
Maximum:	83%

Although the employer contribution of 18% is "average," the employers in the statewide peer group with contribution rates less than 18% all have funded ratios greater than the PERA Hybrid Plan. The PERA Hybrid Plan has the poorest funded ratio of all members of the peer group. The PERA Hybrid Plan's funded ratio of 58% for the State Division is below the average of 73%, while the funded ratio of 73% for the Local Government and Judges Divisions is equal to the peer group average. Although one might expect higher contribution rates when there are lower funded ratios, there appears to be no such correlation. This is due, in part, to the varying funding policies for each system. Some systems have policies that pay off the unfunded accrued liability over 15 years, which typically requires a higher contribution amount, while others have selected a longer time frame.

Contribution rates vary by plan based on policy and funding issues such as amortization method, benefit levels, and statutory requirements. The wide disparity in the employer contribution rates in the peer group, ranging from 11% to 31%, is primarily due to the amortization policy adopted by the various systems. For example, Louisiana SERS, with the highest employer contribution rate of 31%, has a funding policy to pay off the initial Unfunded Accrued Liability (UAL) by

2029, an amortization timeframe of 15 years. Similarly, Maine with the second highest employer contribution rate of approximately 23% has a funding policy to fully fund the UAL by 2028, an amortization timeframe of 14 years. The PERA Hybrid Plan's timeframe to pay off the UAL, including future contribution rate increases, is 37 years for the State Division, 25 years for the Local Government Division, and approximately 48 years for the Judges Division ("12/31/2014 Actuarial Valuation Results and 40-Year Projections", Cavanaugh Macdonald, June 23, 2015).

The following figure compares the PERA Hybrid Plan's Schools and Denver Public Schools Divisions employer and employee contribution amounts and funded ratios with other teachers systems.



Source: National Association of State Retirement Administrators. Public Funds Survey for Fiscal Year 2013, actuarial valuation reports and Comprehensive Annual Financial Reports, as summarized by Gabriel, Roeder, Smith & Company.

#### *Employee Contributions (Excluding Colorado):*

Average:	10%
Minimum:	6%
Maximum:	15%

As the figure indicates, the PERA Hybrid Plan's Schools Division and Denver Public Schools Division employee contribution rate of 8.0% is the most common employee contribution rate, but is below the teacher peer group average of 10%. Of the 12 entities in this peer group, three have rates of 8% (including two for Colorado) and two have rates less than 8%. One thing to note, however, is that most of the peer Teacher plans all have automatic COLAs that are

considered part of the benefit, while for the post-2006 PERA hires, the COLA is not automatic and is not included in the liabilities of the actuarial valuation of the plan. As a result, the PERA Hybrid Plan's new hire costs are lower than those of a similarly situated peer with an automatic COLA.

*Employer Contributions (Excluding Colorado):*

Average:	20%
Minimum:	7%
Maximum:	34%

The PERA Hybrid Plan's Schools Division and Denver Public Schools Division employer contribution rate of 18% is below the teacher peer group average of 20%. Note that this comparison is based on January 1, 2015 PERA contribution rates and does not take into account any projected future contribution increases. Also, note that the PERA Hybrid Plan's contributions include 1.02% for the Health Care Trust Fund and 1% for the Annual Increase Reserve.

*Funded Ratio (Excluding Colorado):*

Average:	62%
Minimum:	41%
Maximum:	83%

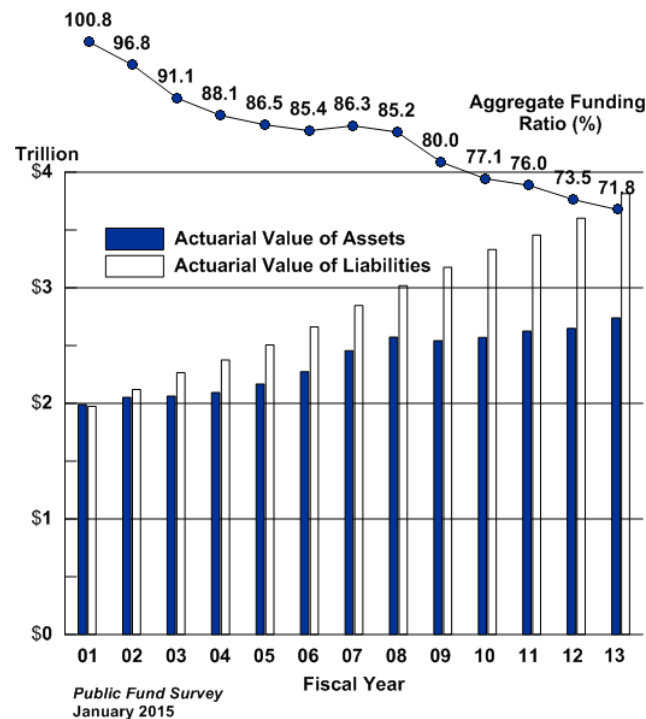
Unlike the statewide plan comparison, the PERA Hybrid Plan's funded ratio for teachers is closer to average because teacher plans in general tend to be less well funded. The PERA Hybrid Plan's funded ratio of 60% for the Schools Division is slightly below the peer group average of 62%. The Denver Public Schools Division's funded ratio at 81% is the second highest within this peer group. This is due in part to the additional funding that came from the Certificates of Participation, which funded the Denver Public Schools Division. Although one might expect higher contribution rates when there are lower funded ratios, there appears to be no such correlation. This is due, in part, to the varying funding policies for each system. Some have policies that pay off the unfunded accrued liability over 15 years, while others have selected a longer time frame.

**Funded Ratios-National Averages**

Following are two graphs displaying historical funded ratios for public funds in general and for the PERA Hybrid Plan specifically. The first graph, which is from the National Association of State Retirement Administrators January 2015 Summary of Findings, shows the steady decline in funding levels for public funds since Fiscal Year 2001. On an aggregate basis for the public funds in the survey, funded ratios declined from 100.8% in Fiscal Year 2001 to 71.8% in Fiscal Year 2013. The impact of investment losses incurred in 2008-2009 are the primary reason for the declining funded ratio for the past 5 years as losses are recognized in the assets on a smoothed basis.

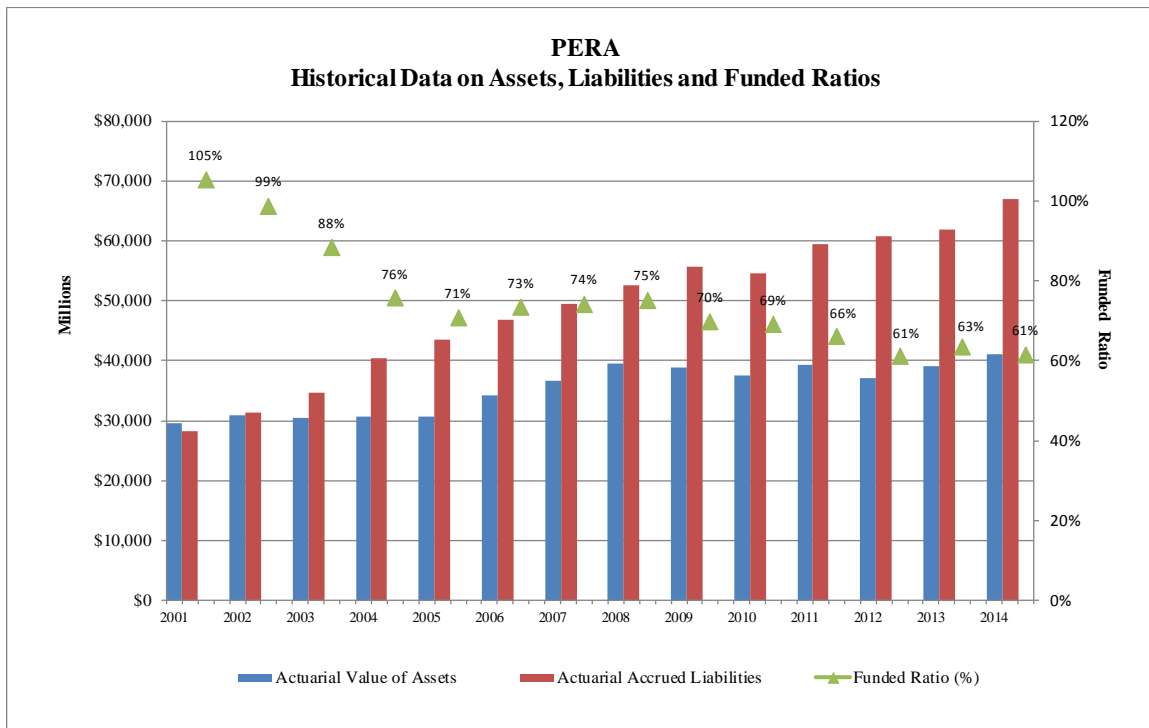
The second graph shows similar historical trends for the PERA Hybrid Plan when all divisions are combined. While the PERA Hybrid Plan follows a similar pattern to the national averages, the decline is much steeper; national averages started at 100.8% and moved to 71.8% while the PERA Hybrid Plan started at 105% and declined to 61% over the same period. On an aggregate basis of all divisions combined, the PERA Hybrid Plan's funded ratio on the Actuarial Value of Assets of 61% is below the national average of 71.8% in the Public Fund Survey.

**Public Fund Survey-Aggregate Funded Ratio for Fiscal Year 2013 of 71.8%  
Historical Information on Aggregate Assets, Liabilities and Funded Ratios**



Source: National Association of State Retirement Administrators January 2015 Summary of Findings.





Source: Colorado PERA Comprehensive Annual Financial Reports, as summarized by Gabriel, Roeder, Smith & Company.

Note: The Denver Public Schools Division joined PERA in 2010.

## COMPARISON TO PRIVATE SECTOR PLANS

Section 24-51-614(5) (a), C.R.S. requires a comparison of the current PERA Hybrid Plan to private sector plans. This section introduces this comparison by summarizing the trends in private sector retirement plans; comparing the PERA Hybrid Plan to large local private sector plans; and, based on the trends as well as the actual design of large local private sector plans, two “Private Sector” plan models were developed for use in the alternative plan design section of this report.

The table below summarizes recent trends in private sector plans; see Appendix F for additional information on trends. In general, private sector plans have moved away from defined benefit plans. However, that move is so recent that it is still too early to tell whether retirements will be “adequate” in the private sector.

Private Sector Plan Trends		
	Prior Trends	Current Trends
Less overall coverage in defined benefit plans	1990s: 35% of all private industry workers covered	2011: 18% of all private industry workers covered
Shift from defined benefit to defined contribution plans (salaried employees covered by private sector plan)	1990: 38% defined contribution only, 29% defined benefit only, 33% both defined contribution and defined benefit	2011: 69% defined contribution only, 7% defined benefit only, 24% both defined contribution and defined benefit
Trend to more defined benefit plans closed to new entrants	2009: 20% participants in plan closed to new entrants	2011: 25% participants in plan closed to new entrants
Shift toward cash balance plans	1980: 98% traditional defined benefit, 2% alternative designs	2010: 61% traditional defined benefit, 36% cash balance, 3% alternative designs
Shift toward lower defined benefit formula multiplier for future service of current participants	Example of typical formula: $2.25\% \times \text{pay} \times \text{all service}$	Example of reducing formula multiplier for future service: $2.25\% \times \text{pay} \times \text{pre-2015 service} + 1.25\% \times \text{pay} \times \text{post-2015 service}$ . This option is generally not available to public plans due to contractual law issues.
Shift toward higher defined contribution employer match	2011: Most common employer match of 50% on first 6.0% of employee contributions, with a maximum match of 3.0% of pay	2013: Most common employer match of 100% on first 6.0% of employee contributions, with a maximum match of 6.0% of pay

Source. See Appendix F. Information summarized by Gabriel, Roeder, Smith & Company.

Taking into account the trends noted above, two common private sector plan designs were compared to the PERA Hybrid Plan. Since private sector employees are covered by Social Security in addition to the private sector plans, results below also include Social Security benefits.

### DEFINED CONTRIBUTION AND SOCIAL SECURITY

In comparing the PERA Hybrid Plan to private sector plans, the first comparison in this study is to defined contribution plans that would be in addition to mandatory Social Security. A defined contribution plan has become common in the private sector. A defined contribution plan is an account-based plan, with participants contributing a percent of their salary to their account, often receiving an employer match up to a maximum, and the balance growing with investment returns.

Several large, regional companies were used as a peer group that represents the defined contribution private sector model. Three companies are included in the comparison to PERA-Comcast, Gates Rubber Company, and Great West Life & Annuity Insurance Company (Great-West Financial). These companies employ between 4,400 to 126,000 employees. Gates Rubber Company and Great-West Financial have their U.S corporate headquarters in the Denver area. These companies compete with PERA employers when hiring new employees, so comparing their benefits to those offered by the PERA Hybrid Plan is useful in determining whether competitive benefits are offered. Below is a summary of benefits provided by these companies.

Private Sector Defined Contribution Benefit	
Private Sector Defined Contribution Plan 1	50% employer match on first 8% of employee contribution, maximum of 4.0% of pay match
Private Sector Defined Contribution Plan 2	100% employer match on first 4.5% of employee contribution, maximum of 4.5% of pay match
Private Sector Defined Contribution Plan 3	3% basic employer contribution plus 100% employer match on first 3% of employee contribution, maximum of 6% of pay match

Source: Public information as summarized by Gabriel, Roeder, Smith & Company.

### Replacement Ratios for PERA Hybrid Plan Compared to Defined Contribution Plans

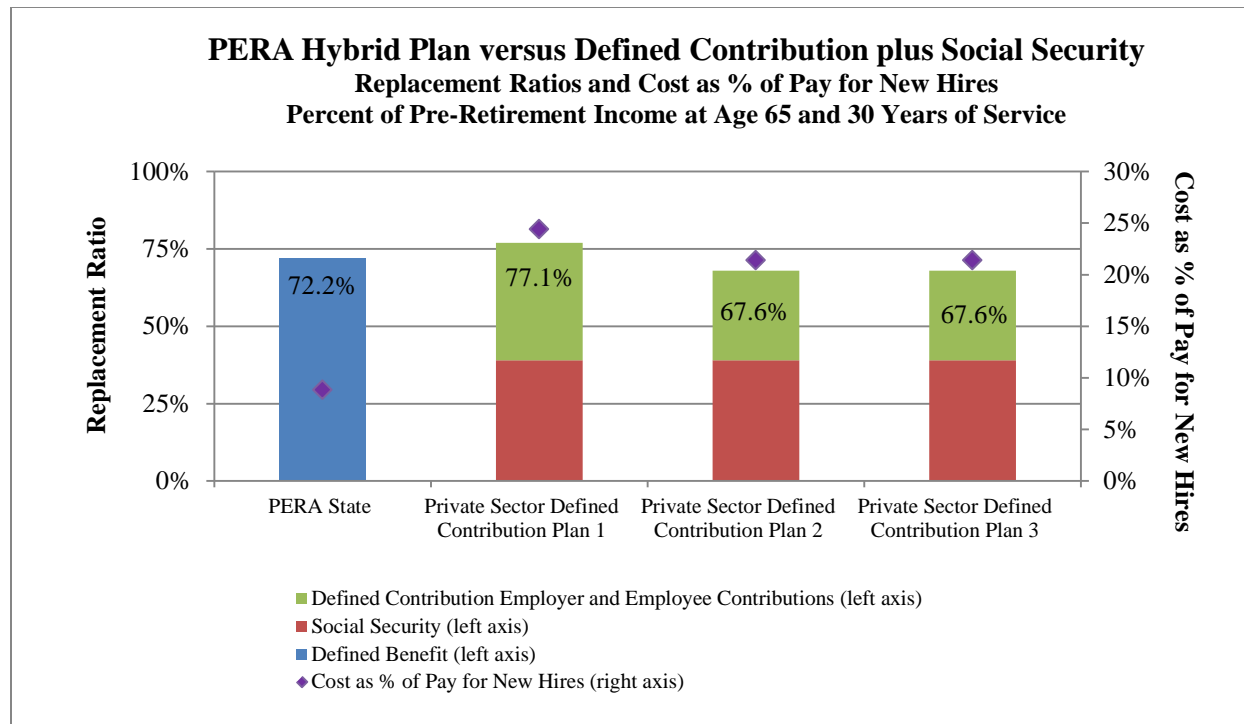
The replacement ratios *including Social Security* for these sample corporations are shown below, compared to PERA.

For purposes of the illustration in this section, the analysis has been simplified by assuming that participants are making the maximum contribution to get the full employer match. However, this is not often the case. To fully evaluate this plan, additional assumptions to consider would be the participation rates, average savings rates, rates of return, loan activity, and “leakage” (which refers to participants taking lump sums when they terminate instead of rolling over the account balance and retaining for retirement).

In this section, Social Security is estimated with a 39% replacement ratio for a medium income participant retiring in 2014 with career average earnings of approximately \$47,000, based on the 2014 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds. Note that this assumption is income dependent. For low income participants with career average earnings of approximately \$21,000, this replacement ratio is approximately 53% and for high income participants with career average earnings of approximately \$75,000, this replacement ratio is approximately 32% (see Appendix G for further details).

As the following graph indicates, the only corporate plan design which surpasses the PERA Hybrid Plan replacement ratio for a full career employee is the design of Social Security plus a Defined Contribution plan that has an 8% employee contribution and an employer contribution of 4% of pay (for a 24.4% of pay total contribution: 12% to the defined contribution plan and 12.4% to Social Security), with a higher cost as a percent of pay for new entrants than the PERA Hybrid Plan. The defined contribution portion is highly dependent upon the underlying assumption used for investment return. Note that the investment return assumption for the defined contribution plan analysis is 2% less than the valuation investment return assumption.

The graph below shows a comparison of replacement ratios and costs as a percent of pay *for new hires* for the defined contribution private sector model compared to the PERA Hybrid Plan. Additional information on the benefits and costs of this and other alternative plans are discussed in Section V.



Source: Gabriel, Roeder, Smith & Company

Assumptions for the replacement ratios shown above are:

- Investment return for Defined Contribution plan of 5.5%. (For further information on this assumption, please see Section V, Return Assumptions for the Defined Contribution Plan Comparisons.)
- Social Security full retirement age is 67, with reduced Social Security shown for age 65
- Pay increased based on assumptions used in the December 31, 2013 PERA actuarial valuation report
- Employees contribute to get full match in the Defined Contribution plan

### Termination Income for PERA Hybrid Plan Compared to Defined Contribution Plans

One of the key features of the defined contribution plans and trends in the private sector is that portability of benefits is important, especially with the more mobile workforce. As a result, not all participants value a career benefit nor plan to stay with an employer until age 65.

The following table shows the portability of three sample defined contribution plans compared to the PERA Hybrid Plan for short-service employees leaving after 10, 7, and 3 years of service.

As noted previously in this report, the PERA Hybrid Plan allows participants to keep their contributions in the plan and receive a 100% employer match at retirement eligibility. Some participants take their lump sum benefit at termination. The results below show the lump sums available at termination for an employee hired at age 25 with \$25,000 salary, broken down by employee contributions with interest (EE) and employer matching contributions (ER). All

employees are assumed to contribute at 8%, even though the maximum match in the defined contribution plans is lower, in order to make a more equitable comparison. The employee contributions in the PERA Hybrid Plan are assumed to earn the current PERA rate of 3.0% while the private sector defined contribution employee contributions are assumed to earn a 5.5% return, as previously discussed for defined contribution plan assumptions. As the table shows, private sector plans provide greater lump sum benefits at termination than the current PERA Hybrid Plan. This is due largely to the 5.5% rate of return in the private sector plans, as compared to the 3% rate of return under PERA.

Lump Sum Payable at Termination PERA Hybrid Plan Compared to Alternative Private Sector Defined Contribution Models All Members Assumed to Contribute 8% of pay												
Years at Termination	PERA Hybrid Plan 8% of pay employee contribution 3% rate of return			Private Sector DC Plan 1 50% employer match on first 8%, maximum of 4.0% of pay 5.5% rate of return			Private Sector DC Plan 2 100% employer match on first 4.5%, maximum of 4.5% of pay 5.5% rate of return			Private Sector DC Plan 3 3% employer basic plus 100% employer match on first 3%, maximum of 6% 5.5% rate of return		
	EE	ER	Total	EE	ER	Total	EE	ER	Total	EE	ER	Total
10	\$31,400	\$15,700	\$47,100	\$34,800	\$17,400	\$52,200	\$34,800	\$19,600	\$54,400	\$34,800	\$26,100	\$60,900
7	\$19,000	\$9,500	\$28,500	\$20,400	\$10,200	\$30,600	\$20,400	\$11,500	\$31,900	\$20,400	\$15,300	\$35,700
3	\$6,700	\$0	\$6,700	\$6,800	\$3,400	\$10,200	\$6,800	\$3,800	\$10,600	\$6,800	\$5,100	\$11,900

Source: Gabriel, Roeder, Smith & Company

The defined contribution plans shown above provide higher portability benefits than the PERA Hybrid Plan at termination for short-service participants. One of the differences is that the PERA Hybrid Plan has a 5 year vesting requirement to receive an employer match and the defined contribution plans have a vesting period of 3 years or less. In addition, the private sector defined contribution plans have an assumed rate of return of 5.5% (non-guaranteed) while PERA guarantees a 3% rate of return. However, the private sector plans do not allow members to keep their money in the plan in order to receive a higher employer match at retirement.

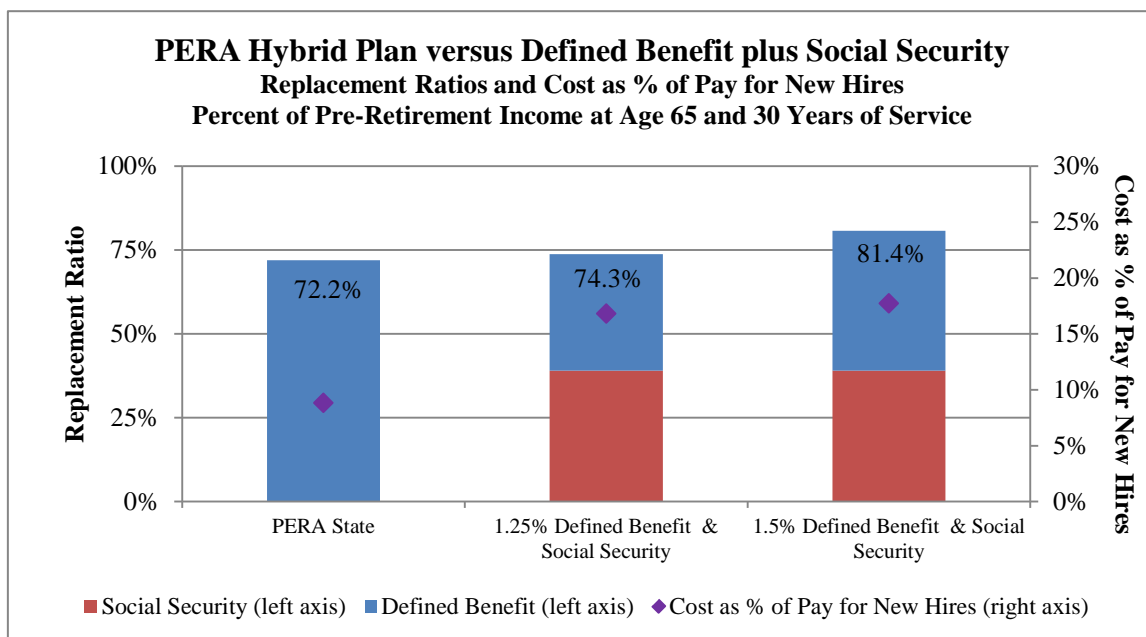
## DEFINED BENEFIT AND SOCIAL SECURITY

The next private sector model is a defined benefit plan that would be in addition to mandatory Social Security. Employers that participate in Social Security offer a lower benefit accrual rate in their defined benefit plans than seen in the public sector plans that do not participate in Social Security. Approximately 32% of defined benefit plans in the private sector still use a formula based on final average pay, with a typical benefit accrual rate of 1.25% to 1.5% times pay times service. (*The last private industry pension plans: a visual essay*, William J. Wiatrowski, Monthly Labor Review, December 2012).

Although the following two plan designs are not based on specific private defined benefit plans, primarily because there are not large, local companies with this plan design, they are used to illustrate the historical levels of replacement ratios that the traditional plans provided.

The following figure shows the replacement ratios of defined benefit plans with 1.25% and 1.5% defined benefit formula multipliers plus Social Security compared to the PERA Hybrid Plan, assuming final average pay of 5 years for the private sector plans. As the figure indicates, private sector plans with Social Security and a defined benefit plan replace a greater amount of pre-retirement income than the PERA Hybrid Plan, but at higher costs as a percent of pay for new entrants than PERA.

The graph below shows a comparison of replacement ratios and costs as a percent of pay for *new hires* of the defined benefit private sector model compared to the PERA Hybrid Plan. Additional information on the benefits and costs of this and other alternative plans are discussed in Section V.



Source: Gabriel, Roeder, Smith & Company

### Termination Income for PERA Hybrid Plan Compared to Defined Benefit Plans

The PERA Hybrid Plan offers termination income for members, as shown in the previous section comparing it to defined contribution plans. Most private sector defined benefit plans offer annuities only and do not provide termination income.

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## **SECTION VII**

IMPACTS AND COST TO EMPLOYEES,  
TAXPAYERS, AND EMPLOYERS FROM  
TRANSITIONING FROM CURRENT PLAN TO  
ALTERNATIVE PLAN DESIGNS

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## SECTION VII

### IMPACTS AND COST TO EMPLOYEES, TAXPAYERS, AND EMPLOYERS FROM TRANSITIONING FROM CURRENT PLAN TO ALTERNATIVE PLAN DESIGNS

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This section examines the economic impact of closing the PERA Hybrid Plan to new entrants. The loss of PERA's perpetual nature requires greater examination of the cash flows of the Plan as well as the amortization of the unfunded accrued liability in order to assure that sufficient funds are accumulated to pay benefits when due.

The unfunded accrued liability is a debt which must be handled separately from the issue of the ongoing annual costs (normal costs) of the plan. There is no way to eliminate the unfunded accrued liability since it represents the value of the benefits earned by members to date; no change in plan structure will eliminate this debt. Thus, in examining the impact for any transition, a key component of the examination is in the policy around how the unfunded accrued liability will be paid.

In this section of the report, the Standards of Actuarial Practice, which are promulgated by actuaries and used by actuaries in their work, are discussed relative to the issue of handling the funding of the unfunded accrued liability if the current PERA Hybrid Plan was "closed" to new entrants. As discussed in the upcoming pages, as actuaries we would recommend funding consistent with these Standards of Practice. The quantitative impacts of closing the PERA Hybrid Plan and accelerating the unfunded accrued liability amortization are illustrated and compared to PERA's current funding policy for amortization. This economic impact of a plan closure is then illustrated for each division. For purposes of this analysis, members of the PERA Hybrid Plan are assumed to continue in PERA under the current plan of benefits until their ultimate retirement date.



**KEY FINDINGS**

*Not all plan sponsors will follow the actuarial recommendation to accelerate the funding of the unfunded accrued liability in the closed pension plan. However, for plan sponsors who do, the plan contributions will need to increase greatly for a short period of time. After a few years, the costs will drop considerably for a net effect that the acceleration will pay off the unfunded accrued liability and save money over the long term.*

*For example, the impact to budget for accelerating the payment on the unfunded accrued liability and implementing a cash balance plan for new hires is nearly an additional \$800 million in the first year. If the payment on the unfunded accrued liability is not accelerated and a cash balance plan is implemented for new hires, the impact to budget is an additional \$22 million in the first year, and increases every year thereafter.*

*This additional budget requirement occurs due to the acceleration of the payment of the unfunded and the higher contribution requirements under the cash balance plan for new hires. The underlying benefit structure for current participants has not changed. Once the unfunded accrued liability is paid off, then the underlying plan structure will dictate the ongoing costs of the plan. Based on the findings of this study, since all alternative plans cost more, the implementation of one of the alternative plans when combined with the acceleration of the payment of the unfunded accrued liability will raise the costs overall when compared to leaving the underlying plan at its current design.*

*In examining the impact of closing the PERA Hybrid Plan to new entrants and transitioning to an alternative plan, we observed the following:*

- *The State cannot eliminate the unfunded liability by moving new hires to an alternative plan, but must develop a plan to address the existing unfunded accrued liability.*
- *Contributions are accelerated into the closed PERA Hybrid Plan to reflect the policy of ensuring adequate funds exist by the time members all reach retirement age and the time for funding is assumed to be the remaining working lifetime of the current active members.*
- *Should the State decide not to accelerate the payments on the unfunded, annual plan costs will still require additional budgetary resources, due to the higher costs of any of the alternative plans.*
- *Closing the PERA Hybrid Plan may alter the risk profile of the plan, thereby altering the allocation of assets and changing the long term expected return on plan investments.*
- *Potential changes in the asset allocation and related expected returns could increase the unfunded liability due to lower than expected investment returns of the closed Defined Benefit fund.*

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## A PRIMER ON ACTUARIAL FUNDING

The funding of the pension plan can be thought of in two key pieces: (1) the funding of the annual costs of the plan that accrue each year, and (2) the “paying off” of the unfunded accrued liability. The annual costs are referred to as the normal cost, and the payment on the unfunded accrued liability is the amortization payment.

The normal cost is determined by the plan’s funding method, which is described in the Internal Revenue Code. In an ideal world where all actuarial assumptions are always met, and where all contributions are made, the plan’s annual cost would always be the normal cost and the accrued liability would be the value of all past normal costs, and assets would always equal the accrued liability. Then, when a member reaches retirement age, the sum of those normal costs that have been contributed on his or her behalf each year now total the present value of all the retirement checks he or she is about to receive and his or her benefits are thus “fully funded” and no further contributions would be required on his or her behalf.

However, actuarial assumptions are not always met; the accrued liability, which in the ideal world would be the value of all past normal costs now also includes those variations from assumptions. When the assets are less than this accrued liability, then an unfunded accrued liability exists and a payment must be made on that unfunded accrued liability.

The payment amount is determined in accordance with the funding policy established by the plan sponsor. If the plan sponsor’s policy is to have the unfunded accrued liability “fully paid off” in 30 years and the sponsor wants the same dollar amount due each year, then the amortization method would be a 30-year closed, flat dollar amount amortization method. If, however, the plan sponsor wants the amortization payment to be a level percent of pay where the dollar amount of the payment would grow each year, then the amortization method would be 30-year, closed level percent of pay.

Plan sponsors may also select an amortization method that does not pay off the unfunded accrued liability. This is done by using an amortization method that “resets” the period of amortization each year. This is termed an “open” amortization.

Colorado PERA adopted a funding policy in March 2015 that uses a level percent of pay 30-year closed amortization method. Once established, the amortization period of the initial unfunded accrued liability is closed and decreases by one year annually. Additional amortization components will be established each year to reflect increases or decreases in the unfunded accrued liability with a closed amortization period of 30 years from the valuation date. However, the actual rates for amortization are set in statute and include the additional AED and SAED amortization payment components. Thus, while the declared method is level percent of pay and 30-year closed amortization, the actual impact of the statute and the payments is to pay off the unfunded liability over a given period of time; for the State Division the pay off period is 37 years.

## MECHANICS OF THE TRANSITION

For purposes of this study, we have assumed that “transition” refers to the gradual movement of a defined benefit structure (PERA Hybrid Plan) to another type of structure (yet to be defined). The transition from one plan to another for all PERA-eligible employees would occur as members are hired; that is, all new hires would enter into the new plan and the current PERA program would be “closed” to new entrants.

For certain new plan designs which are defined benefit plan formulas, we have assumed that a new “tier” would be added to PERA and thus there would be no “closure” of the defined benefit plan. The implication of this assumption is that the amortization method and policy can remain at its current practice of the 30-year closed level percent of pay amortization.

## ACTUARIAL STANDARDS AND CLOSED PLANS

As actuaries we would provide recommendations consistent with these Standards of Practice that recommend using a shorter period for paying off the unfunded accrued liability and also recognizing in the assumptions that the payroll for the closed group will not be increasing. The result of these recommendations would be an increase in the payment to amortize the unfunded accrued liability.

The Actuarial Standards of Practice #4, *“Measuring Pension Obligations and Determining Pension Plan Costs or Contributions,”* issued by the Actuarial Standards Board, provides general guidance on how a contribution should be determined.

“When selecting a contribution allocation procedure, the actuary should select a contribution allocation procedure that, in the actuary’s professional judgment, is consistent with the plan accumulating adequate assets to make benefit payments when due, assuming that all actuarial assumptions will be realized and that the plan sponsor or other contributing entity will make actuarially determined contributions when due.”

For a closed plan, this means that the assets need to be accumulated by the time all existing members have retired. Under PERA’s current policy, the unfunded accrued liability is expected to be fully amortized in 37 years for the State Division. In order to be fully funded at that time, the funding method would be changed to an amortization policy that ensures that the plan is fully funded by the time there are no more active members making contributions. This is a period of time equal to the average future working lifetime of the remaining active group, typically around 10 years. Further, in recognition that the payroll of this closed group will not be increasing (and thus the payroll for this closed group will not be providing increasing contributions), the amortization method must assume that a flat dollar amount will be paid off each year. This is a change from the 30-year closed level percent of pay, which is based on the assumption that contributions will increase each year, as payroll increases. These changes produce higher contribution requirements in the short term, since the unfunded accrued liability is being paid off in 10 years rather than 37 or more years.

Although actuarial standards recommend that the unfunded accrued liability amortization period be accelerated, the General Assembly may decide to follow a funding plan that does not accelerate the funding into the PERA Hybrid Plan. One alternative would be to continue to fund benefits as they are currently being funded. Depending on the funding period used to pay off the unfunded accrued liability, the delay, while not jeopardizing the payment of future benefits, will increase the contributions over time to PERA. It is beyond the scope of this study to assess the opportunity costs relative to the contributions to be made to PERA.

## **QUANTITATIVE IMPACTS**

### **Transition and Budget Impacts**

When transitioning to a new plan there are three primary areas of impact. These areas are 1) the initial increase in cost due to the acceleration of the payment on the Unfunded Accrued Liability; 2) the overall increase for a new plan which costs more than the current plan and 3) the longer term effects of declining cash flow and the ultimate change in risk profile and the decreased returns to the fund.

#### **Initial Cost Due to Acceleration of the Payment on the Unfunded Accrued Liability**

As discussed previously, when a plan closes, a sound actuarial practice would include changing the amortization method from a 30-year period to a period that pays off the unfunded by the time all those active members in the closed plan reach their retirement age. (For this study we have assumed a 10-year period). In addition, the assumption that all amortization payments will be “increasing” with increasing payroll from new hires should be changed to a flat payroll (that is, a flat dollar amount of payment) since the payroll of the participating members will not be growing over the long term. Both of these changes will increase the annual amount of the amortization payment.

#### **Increasing Costs for the New Plan**

Section V illustrated how the “new hire” costs for all of the alternative plans is higher than the PERA Hybrid Plan for the delivery of the same amount of retirement benefits. Thus, the costs for transitioning to a new plan will need to include the year-by-year additional costs for the new plan.

#### **Long Term Impact-Change in the Earnings of the Trust**

Closing the PERA Hybrid Plan to new entrants will result in a population that will eventually be comprised entirely of pensioners. This closure impacts the risk profile of the trust and hence investment strategy. Increased liquidity is needed as the benefit payments increase and contributions decrease.

A recent study has shown that adjustments to the asset allocation in order to reduce the risk profile and increase liquidity as a result of closing a defined benefit plan can reduce the expected net returns to a plan by approximately 0.8% on a long-term basis (27 years) and 1.4% on an intermediate-term basis (less than 10 years). (*Pension Benefit Design Study*, Teacher Retirement System of Texas, September 1, 2012.) Although these results are for a specific system and asset allocation, they are consistent with other studies and are illustrative of the impact that could occur.

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## IMPACT OF TRANSITIONING TO CASH BALANCE PLAN

For purposes of this study, we chose a Cash Balance Plan as an alternative plan to illustrate the impact to the State of transitioning to a new plan structure. Our analysis shows the costs associated with transitioning to a Cash Balance Plan if the State accelerates payment of the unfunded accrued liability, as actuarially recommended, and if the State continues to apply the current 37-year funding methodology (no acceleration).

### Budget Impacts for Transitioning New Hires to a Cash Balance Plan

In assessing the budget impacts, the illustrations look at the difference in the actuarially determined contributions. The State Division is not currently receiving contributions equal to the actuarially determined contribution, so the true budget impact would be even greater, if the budget were to be set equal to the actuarially determined contribution.

As the following chart illustrates, the *additional* budget requirements (additional contributions over the current PERA actuarially determined contribution) would have started in the year 2014 for \$800 million. Throughout the 10-year period, the *additional* budget requirements would remain between \$800 and \$900 million. After the 10-year period, the savings due to the acceleration of the payment of the unfunded liability would materialize, resulting in a total cost over the 40-year projection period to transition from the PERA Hybrid Plan of \$8.9 billion.

The source of the additional costs comes from the acceleration of the paying off of the unfunded accrued liability and the higher cost for the Cash Balance Plan. Although there is a substantial impact to the budget in the first 10 years, over the entire 40-year projection period the amortization costs are lower when compared to the current funding policy. This study does not include the impact of earning lower rates of return as the defined benefit fund declines in size and risk tolerance.

The 2014 normal cost shown in the table below of 10.30% is a blended rate for all of the participants in the valuation. This differs from the State Division normal cost of 8.82% used in Section V, which is the normal cost for the new members hired on or after January 1, 2011.

<b>Additional Budget Requirements For Transitioning to a Cash Balance Plan State Division Closed Plan Actuarially Recommended Funding Policy</b>										
Payroll (000's)				Current PERA Hybrid Plan, Projections			New Hires in Cash Balance Plan, Projections			Additional Budget
Fiscal Year	Payroll (000's)			Normal Cost %	UAAL Payment (%)	Total Cost (%)	Normal Cost %	UAAL Payment (%)*	Total Cost (%)	to Transition to New Plan (000's)
	Existing	New	Total	Total		(= 2. + 3.)	Total		(= 5. + 6.)	(= (7. - 4.)) x 1.)
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2014	\$2,571,489	\$0	\$2,571,489	10.30%	20.10%	30.40%	10.30%	51.20%	61.49%	\$799,519
2015	2,324,073	314,601	2,638,674	10.34%	19.80%	30.14%	11.17%	49.89%	61.06%	815,968
2016	2,178,776	528,205	2,706,981	10.28%	19.10%	29.38%	11.63%	48.63%	60.26%	835,934
2017	2,055,293	726,069	2,781,362	10.22%	18.64%	28.86%	12.00%	47.33%	59.34%	847,729
2018	1,941,498	921,029	2,862,527	10.15%	18.56%	28.71%	12.36%	45.99%	58.35%	848,482
2019	1,838,047	1,115,854	2,953,901	10.08%	18.42%	28.50%	12.66%	44.57%	57.23%	848,660
2020	1,739,163	1,315,060	3,054,223	10.02%	18.25%	28.26%	12.96%	43.10%	56.06%	848,961
2021	1,643,183	1,518,706	3,161,889	9.96%	18.04%	28.00%	13.23%	41.64%	54.86%	849,490
2022	1,549,282	1,729,833	3,279,115	9.91%	17.79%	27.69%	13.48%	40.15%	53.63%	850,532
2023	1,457,177	1,948,517	3,405,694	9.86%	17.50%	27.36%	13.73%	38.66%	52.38%	852,244
2024	1,367,448	2,175,288	3,542,736	9.80%	17.18%	26.98%	13.96%	0.00%	13.96%	(461,108)
2025	1,280,290	2,410,307	3,690,597	9.76%	16.82%	26.58%	14.18%	0.00%	14.18%	(457,357)
2026	1,195,444	2,654,279	3,849,724	9.72%	16.42%	26.15%	14.39%	0.00%	14.39%	(452,412)
2027	1,113,745	2,907,163	4,020,909	9.69%	16.00%	25.69%	14.59%	0.00%	14.59%	(446,114)
2028	1,034,984	3,169,502	4,204,486	9.66%	15.54%	25.20%	14.78%	0.00%	14.78%	(438,258)
2029	956,825	3,444,058	4,400,883	9.64%	15.05%	24.69%	14.96%	0.00%	14.96%	(428,497)
2030	881,494	3,729,457	4,610,951	9.62%	14.54%	24.16%	15.12%	0.00%	15.12%	(416,714)
2031	808,645	4,026,269	4,834,914	9.60%	14.00%	23.60%	15.28%	0.00%	15.28%	(402,661)
2032	738,048	4,335,593	5,073,642	9.59%	13.44%	23.03%	15.42%	0.00%	15.42%	(386,080)
2033	668,466	4,658,852	5,327,318	9.57%	12.86%	22.43%	15.55%	0.00%	15.55%	(366,389)
2034	598,741	4,998,115	5,596,856	9.56%	12.25%	21.82%	15.68%	0.00%	15.68%	(343,533)
2035	531,889	5,351,599	5,883,487	9.56%	11.63%	21.18%	15.79%	0.00%	15.79%	(317,124)
2036	470,064	5,718,067	6,188,131	9.55%	10.98%	20.53%	15.90%	0.00%	15.90%	(286,898)
2037	412,487	6,099,069	6,511,556	9.54%	10.32%	19.86%	15.99%	0.00%	15.99%	(252,391)
2038	358,255	6,496,357	6,854,612	9.53%	9.64%	19.16%	16.06%	0.00%	16.06%	(213,000)
2039	301,089	6,915,423	7,216,512	9.53%	8.94%	18.47%	16.15%	0.00%	16.15%	(167,538)
2040	254,818	7,346,230	7,601,048	9.53%	8.22%	17.75%	16.21%	0.00%	16.21%	(117,006)
2041	212,929	7,795,166	8,008,095	9.52%	7.49%	17.01%	16.26%	0.00%	16.26%	(60,050)
2042	175,580	8,263,534	8,439,114	9.52%	6.74%	16.26%	16.31%	0.00%	16.31%	4,071
2043	142,431	8,752,296	8,894,727	9.52%	5.97%	15.49%	16.35%	0.00%	16.35%	76,237
2044	114,351	9,262,127	9,376,478	9.51%	5.19%	14.71%	16.38%	0.00%	16.38%	156,769
2045	90,762	9,794,528	9,885,291	9.51%	4.39%	13.91%	16.40%	0.00%	16.40%	246,726
2046	71,267	10,351,238	10,422,505	9.51%	3.58%	13.09%	16.42%	0.00%	16.42%	347,082
2047	55,577	10,934,291	10,989,868	9.51%	2.75%	12.26%	16.44%	0.00%	16.44%	458,960
2048	42,940	11,545,795	11,588,735	9.51%	1.90%	11.41%	16.45%	0.00%	16.45%	583,606
2049	32,841	12,187,197	12,220,038	9.51%	1.04%	10.55%	16.46%	0.00%	16.46%	721,894
2050	24,758	12,861,369	12,886,127	9.51%	0.16%	9.67%	16.46%	0.00%	16.46%	875,437
2051	18,439	13,570,127	13,588,565	9.51%	0.00%	9.51%	16.47%	0.00%	16.47%	945,573
2052	13,592	14,315,887	14,329,479	9.51%	0.00%	9.51%	16.47%	0.00%	16.47%	997,577
2053	9,820	15,101,145	15,110,965	9.51%	0.00%	9.51%	16.47%	0.00%	16.47%	1,052,393
Projection values provided by Cavanaugh Macdonald										
*Level dollar payment to pay off the UAL in 10 years										
Total Additional Costs to Transition new hires to Cash Balance Plan over next 40 years (000's):										<b>\$8,850,715</b>

Source: Gabriel, Roeder, Smith & Company. Based on information provided by PERA and projection values provided by Cavanaugh Macdonald. Numbers may not add due to rounding.

The next chart assumes that the funding policy for paying off the unfunded accrued liability will remain as it is today and will spread over 37 years. In that case, the ***additional*** budget requirement starts out at \$22 million in the year 2015 and continues to grow to over \$1 billion by the year 2053. This is due to the higher cost of the Cash Balance Plan. Over the 40-year projection period, the total cost to transition from the PERA Hybrid Plan to a Cash Balance Plan is nearly \$16 billion.

The reason for the difference in methods (the \$16 billion compared to the \$8.9 billion) is due to the interest cost savings achieved for paying off the unfunded accrued liability in 10 years. Of course, it takes money to save money, meaning there will need to be over \$800 million extra dollars to be found in the budget for each of the first 10 years in order to save the \$7.1 billion.



<b>Additional Budget Requirements For Transitioning to a Cash Balance Plan State Division Current Funding Policy</b>									
Payroll (000's)			Current PERA Hybrid Plan, Projections			New Hires in Cash Balance Plan, Projections		Additional Budget	
Fiscal Year	Existing	New	Total	Normal Cost % Total	UAAL Payment (%)	Total Cost (%) (= 2. + 3.)	Normal Cost % Total	Total Cost (%) (= 5. + 3.)	to Transition to New Plan (000's) (= (7. - 4.)) x 1.)
			(1)	(2)	(3)	(4)	(5)	(7)	(8)
2014	\$2,571,489	\$0	\$2,571,489	10.30%	20.10%	30.40%	10.30%	30.40%	\$0
2015	2,324,073	314,601	2,638,674	10.34%	19.80%	30.14%	11.17%	30.97%	21,908
2016	2,178,776	528,205	2,706,981	10.28%	19.10%	29.38%	11.63%	30.73%	36,464
2017	2,055,293	726,069	2,781,362	10.22%	18.64%	28.86%	12.00%	30.64%	49,692
2018	1,941,498	921,029	2,862,527	10.15%	18.56%	28.71%	12.36%	30.92%	63,254
2019	1,838,047	1,115,854	2,953,901	10.08%	18.42%	28.50%	12.66%	31.09%	76,409
2020	1,739,163	1,315,060	3,054,223	10.02%	18.25%	28.26%	12.96%	31.20%	89,733
2021	1,643,183	1,518,706	3,161,889	9.96%	18.04%	28.00%	13.23%	31.26%	103,283
2022	1,549,282	1,729,833	3,279,115	9.91%	17.79%	27.69%	13.48%	31.27%	117,276
2023	1,457,177	1,948,517	3,405,694	9.86%	17.50%	27.36%	13.73%	31.23%	131,783
2024	1,367,448	2,175,288	3,542,736	9.80%	17.18%	26.98%	13.96%	31.14%	147,465
2025	1,280,290	2,410,307	3,690,597	9.76%	16.82%	26.58%	14.18%	31.00%	163,327
2026	1,195,444	2,654,279	3,849,724	9.72%	16.42%	26.15%	14.39%	30.82%	179,865
2027	1,113,745	2,907,163	4,020,909	9.69%	16.00%	25.69%	14.59%	30.59%	197,103
2028	1,034,984	3,169,502	4,204,486	9.66%	15.54%	25.20%	14.78%	30.32%	215,092
2029	956,825	3,444,058	4,400,883	9.64%	15.05%	24.69%	14.96%	30.01%	233,986
2030	881,494	3,729,457	4,610,951	9.62%	14.54%	24.16%	15.12%	29.66%	253,717
2031	808,645	4,026,269	4,834,914	9.60%	14.00%	23.60%	15.28%	29.28%	274,324
2032	738,048	4,335,593	5,073,642	9.59%	13.44%	23.03%	15.42%	28.86%	295,834
2033	668,466	4,658,852	5,327,318	9.57%	12.86%	22.43%	15.55%	28.41%	318,542
2034	598,741	4,998,115	5,596,856	9.56%	12.25%	21.82%	15.68%	27.93%	342,221
2035	531,889	5,351,599	5,883,487	9.56%	11.63%	21.18%	15.79%	27.42%	366,961
2036	470,064	5,718,067	6,188,131	9.55%	10.98%	20.53%	15.90%	26.88%	392,682
2037	412,487	6,099,069	6,511,556	9.54%	10.32%	19.86%	15.99%	26.30%	419,471
2038	358,255	6,496,357	6,854,612	9.53%	9.64%	19.16%	16.06%	25.69%	447,515
2039	301,089	6,915,423	7,216,512	9.53%	8.94%	18.47%	16.15%	25.08%	477,461
2040	254,818	7,346,230	7,601,048	9.53%	8.22%	17.75%	16.21%	24.43%	507,926
2041	212,929	7,795,166	8,008,095	9.52%	7.49%	17.01%	16.26%	23.75%	539,646
2042	175,580	8,263,534	8,439,114	9.52%	6.74%	16.26%	16.31%	23.05%	572,767
2043	142,431	8,752,296	8,894,727	9.52%	5.97%	15.49%	16.35%	22.32%	607,506
2044	114,351	9,262,127	9,376,478	9.51%	5.19%	14.71%	16.38%	21.57%	643,512
2045	90,762	9,794,528	9,885,291	9.51%	4.39%	13.91%	16.40%	20.80%	681,022
2046	71,267	10,351,238	10,422,505	9.51%	3.58%	13.09%	16.42%	20.00%	720,161
2047	55,577	10,934,291	10,989,868	9.51%	2.75%	12.26%	16.44%	19.19%	761,127
2048	42,940	11,545,795	11,588,735	9.51%	1.90%	11.41%	16.45%	18.35%	804,151
2049	32,841	12,187,197	12,220,038	9.51%	1.04%	10.55%	16.46%	17.50%	848,999
2050	24,758	12,861,369	12,886,127	9.51%	0.16%	9.67%	16.46%	16.62%	896,104
2051	18,439	13,570,127	13,588,565	9.51%	0.00%	9.51%	16.47%	16.47%	945,573
2052	13,592	14,315,887	14,329,479	9.51%	0.00%	9.51%	16.47%	16.47%	997,577
2053	9,820	15,101,145	15,110,965	9.51%	0.00%	9.51%	16.47%	16.47%	1,052,393
Projection values provided by Cavanaugh Macdonald.									
Total Additional Costs to Transition NE to Cash Balance Plan over next 40 years (000's):									
									<b>\$15,993,833</b>

Source: Gabriel, Roeder, Smith & Company. Based on information provided by PERA and projection values provided by Cavanaugh Macdonald. Numbers may not add due to rounding.



**QUALITATIVE IMPACTS****ANCILLARY BENEFITS**

An alternative plan such as a defined contribution plan does not cover ancillary benefits such as disability retirements and death benefits, which are integral benefits in the PERA Hybrid Plan. If the policy decision is made to continue to provide these benefits, PERA would need to implement additional plans to provide these benefits outside of the alternative plan. This would result in supplemental contribution requirements and another layer of administration.

**POTENTIAL IMPACT ON THE COST OF PERA OPERATIONS**

PERA has not identified any significant impact on the cost of its operations if the current plan is amended.

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## **GLOSSARY**

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## GLOSSARY

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<b><i>Accrued Liability</i></b>	The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs. The total present value of benefits is the sum of the Accrued Liability and the Present Value of Future Normal Costs.
<b><i>Actuarial Assumptions</i></b>	Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement, and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.
<b><i>Actuarial Cost Method</i></b>	A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of future Normal Costs and the Accrued Liability.
<b><i>Actuarial Equivalent</i></b>	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
<b><i>Actuarial Present Value</i></b>	The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.
<b><i>Actuarial Present Value of Future Benefits</i></b>	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, nonretired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
<b><i>Actuarial Valuation</i></b>	The determination, as of a valuation date, of the Normal Cost, Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan.

<b><i>Actuarial Value of Assets</i></b>	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the contribution requirement. The actuarial value of assets is the asset amount used to determine the unfunded accrued liability, the funded ratio and the contribution requirement.
<b><i>Amortization Equalization Disbursement (AED)</i></b>	Employers are required to make an Amortization Equalization Disbursement (AED). Legislation was passed in 2004 regarding AED requiring employers to make additional contributions to PERA to pay off the unfunded accrued liability faster.
<b><i>Amortization Method</i></b>	A method for determining the Amortization Payment. The choices are level dollar and level percentage of payroll; and open period versus closed period. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAL. Under the Level Percentage of Pay method, the stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase. For an open amortization method (either level dollar or level percent of pay), the amortization period does not decline each year. Thus, at the end of a given period, an open amortization period may still have a remaining UAL balance.
<b><i>Amortization Payment</i></b>	That portion of the plan contribution which is designed to pay interest on and to amortize the Unfunded Accrued Liability.
<b><i>Amortization Period</i></b>	The period used in calculating the Amortization Payment.

<b><i>Closed Amortization Period</i></b>	A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.
<b><i>Employer Normal Cost</i></b>	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
<b><i>Experience Gain/Loss</i></b>	A measure of the liability difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience, i.e., actual results that produce Unfunded Accrued Liabilities which are larger than projected.
<b><i>Funded Ratio</i></b>	The ratio of the Actuarial Value of Assets to the Accrued Liability.
<b><i>Money Purchase Annuity</i></b>	Accumulated employee contributions with interest, matched with employer contributions if applicable, and converted to an annuity payable at retirement, using PERA's long term rate of return assumption of 7.5%.
<b><i>Normal Cost</i></b>	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
<b><i>Open Amortization Period</i></b>	An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. In other words, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year. In theory, if an Open Amortization Period is used to amortize the Unfunded Accrued Liability, the UAL will never completely disappear, but will become smaller each year, either as a dollar amount or in relation to covered payroll.

<b><i>Replacement Ratio</i></b>	Replacement ratios are the proportion of retirement income to total pay immediately prior to retirement.
<b><i>Service Retirement Formula</i></b>	An annual benefit equal to 2.5% x service x highest average three years of salary, payable as an annuity at retirement.
<b><i>Supplemental Amortization Equalization Disbursement (SAED)</i></b>	Employers are required to make a Supplemental Amortization Equalization Disbursement (AED). Legislation was passed in 2006 regarding SAED requiring employers to make additional contributions to PERA to pay off the unfunded accrued liability faster.
<b><i>Unfunded Accrued Liability (UAL)</i></b>	The difference between the Accrued Liability and Actuarial Value of Assets.
<b><i>Valuation Date</i></b>	The date as of which the Actuarial Present Value of Future Benefits are determined. The benefits expected to be paid in the future are discounted to this date.

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## APPENDICES

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## APPENDIX A

COLORADO REVISED STATUTES SECTION 24-51-  
614

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APPENDIX A  
COLORADO REVISED STATUTES SECTION 24-51-614

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**24-51-614. Employee retirement benefit study.** (4) (a) THE STATE AUDITOR, WITH THE CONCURRENCE OF THE ASSOCIATION, SHALL RETAIN A NATIONALLY RECOGNIZED AND ENROLLED ACTUARIAL FIRM WITH EXPERIENCE IN PUBLIC SECTOR PENSION PLANS TO CONDUCT THE STUDIES DESCRIBED IN SUBSECTIONS (5) AND (6) OF THIS SECTION. THE STATE AUDITOR SHALL ADMINISTER A REQUEST FOR PROPOSALS PROCESS AND SOLICIT INDEPENDENT THIRD-PARTY FIRMS WITH THE NECESSARY CREDENTIALS TO BID FOR PERFORMANCE OF THE STUDIES. THE STATE AUDITOR SHALL SELECT A FIRM THAT HAS A HISTORY OF UNBIASED PEER-REVIEWED RESULTS AND SHALL NOT SELECT A FIRM THAT HAS A KNOWN CONFLICT OF INTEREST THAT MAY INTERFERE WITH ITS ABILITY TO PRODUCE AN OBJECTIVE REPORT. ANY FIRM THAT RESPONDS TO THE REQUEST FOR PROPOSALS SHALL DISCLOSE ANY ASSOCIATION THAT IT HAD OR CURRENTLY HAS WITH A BIASED GROUP. THE STATE AUDITOR AND THE ASSOCIATION MAY RETAIN ONE FIRM TO CONDUCT BOTH STUDIES REQUIRED PURSUANT TO SUBSECTIONS (5) AND (6) OF THIS SECTION OR MAY RETAIN A SEPARATE FIRM TO CONDUCT EACH STUDY. IF, FOLLOWING GOOD FAITH EFFORTS, THE STATE AUDITOR AND THE ASSOCIATION DO NOT CONCUR REGARDING THE SELECTION OF THE FIRM OR FIRMS BY OCTOBER 1, 2014, THE STATE AUDITOR SHALL RETAIN THE FIRM OR FIRMS PREFERRED BY THE STATE AUDITOR. THE STATE AUDITOR SHALL ENTER INTO A CONTRACT WITH THE SELECTED FIRM OR FIRMS BY OCTOBER 31, 2014.

(b) THE STATE AUDITOR AND THE ASSOCIATION SHALL CONFER WITH THE OFFICE OF STATE PLANNING AND BUDGETING TO DETERMINE THE SCOPE OF THE STUDY REQUIRED BY SUBSECTION (5) OF THIS SECTION AND THE ANALYSIS REQUIRED BY SUBSECTION (6) OF THIS SECTION.

(5) (a) THE FIRM SELECTED PURSUANT TO SUBSECTION (4) OF THIS SECTION SHALL PERFORM A COMPREHENSIVE STUDY COMPARING THE COST AND EFFECTIVENESS OF THE CURRENT HYBRID DEFINED BENEFIT PLAN DESIGN ESTABLISHED IN THIS ARTICLE TO ALTERNATIVE PLAN DESIGNS IN THE PUBLIC AND PRIVATE SECTOR. THE DUTY MUST INCLUDE THE FOLLOWING:

(I) A COMPARISON OF THE BENEFITS, COST AND PORTABILITY OF BENEFITS PROVIDED BY THE ASSOCIATION IN ITS CURRENT PLAN DESIGN WITH THE BENEFITS, COSTS AND PORTABILITY OF BENEFITS PROVIDED BY ALTERNATIVE PLAN DESIGNS;

(II) A COMPARISON OF THE CURRENT PLAN DESIGN TO OTHER STATEWIDE PLANS, PRIVATE SECTOR RETIREMENT PLANS, AND ANY OTHER APPROPRIATE PLANS AS DETERMINED BY THE ASSOCIATION AND THE OFFICE OF THE STATE AUDITOR;

(III) AN ANALYSIS OF THE COST TO EMPLOYEES AND EMPLOYERS THAT WOULD BE INCURRED BY TRANSITIONING FROM THE CURRENT PLAN DESIGN ADMINISTERED BY THE ASSOCIATION TO ALTERNATIVE PLAN DESIGNS;

(IV) THE IMPACT THAT A CHANGE FROM THE CURRENT PLAN DESIGN TO ALTERNATIVE PLAN DESIGNS WOULD HAVE ON EXPECTED RETIREMENT BENEFITS FOR CURRENT AND FUTURE RETIREES OF THE ASSOCIATION;

(V) THE INCREMENTAL IMPACTS THAT A CHANGE FROM THE CURRENT PLAN DESIGN TO ALTERNATIVE PLAN DESIGNS WOULD HAVE ON THE ASSOCIATION'S ABILITY TO FULLY AMORTIZE THE UNFUNDED ACTUARIAL ACCRUED LIABILITY OF EACH DIVISION OF THE ASSOCIATION; AND

(VI) THE IMPACT THAT A CHANGE FROM THE CURRENT PLAN DESIGN TO ALTERNATIVE PLAN DESIGNS WOULD HAVE ON EMPLOYERS AND TAXPAYERS RELATIVE TO THE PLAN DESIGN CURRENTLY SPECIFIED IN LAW.

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## APPENDIX B

### ALTERNATIVE PLAN MODELS SENSITIVITY TO INVESTMENT EXPERIENCE

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## APPENDIX B

### ALTERNATIVE PLAN MODELS SENSITIVITY TO INVESTMENT EXPERIENCE

This section is included to comply with the following requirement:

*“The study should also consider three rate of return assumption options for each alternative plan design (e.g., best estimate, lower than best estimate, higher than best estimate).”* (The Request for Proposal for a Study of the Colorado Public Employees’ Retirement Association (PERA) Hybrid Defined Benefit Plan issued by the Colorado Office of the State Auditor).

The following exhibit shows the sensitivity of alternative plan models to investment experience for the State Division using the Targeted Benefit Approach. The alternative plan analysis assumed defined benefit plans earned 7.5% investment returns and defined contribution plans earned 5.5% investment returns. If the defined benefit plan earns less or more than the assumption, the benefit stays the same, but the contribution varies. If the defined contribution plan earns less or more than the assumption, the contribution stays the same, but the benefit varies. Some of the alternatives had a combination of both defined benefit and defined contribution elements. The chart below shows the sensitivity of the alternative plan analysis to the investment return varying by 1% above or below the assumption.

#### Targeted Benefit Approach for the State Division

Sensitivity to Investment Experience (Impact on Replacement Ratio)							
Plan Structure	State Contribution <sup>1</sup>	Member Contribution <sup>1</sup>	Replacement Ratio at Age 65 <sup>2</sup>			Percent Change in Replacement Ratio from 1% Decrease in Investment	Impact on Contributions and Replacement Ratios
			-1.0%	7.5%	+1.0%		
Current PERA Hybrid Plan	0.82%	8.00%	72.2%	72.2%	72.2%	0.0%	Adverse experience absorbed by contribution increases. Benefits are fixed.
Defined Benefit and Defined Contribution Side by Side Plan	5.29%	9.03%	68.4%	72.2%	76.8%	-5.3%	Adverse experience "shared" by contributions (Defined Benefit) and benefits (Defined Contribution).
Cash Balance Plan	8.08%	8.00%	62.2%	72.2%	84.5%	-13.9%	Adverse experience "shared" by contributions and benefits. The first years of experience are absorbed by the active member's account balance. After retirement, the adverse experience is absorbed by contributions.
Self-Directed Defined Contribution Plan	13.87%	8.00%	62.8%	72.2%	83.6%	-13.1%	Adverse experience absorbed by benefit. Contributions are fixed.
Defined Benefit and Social Security	10.26%	6.20%	72.2%	72.2%	72.2%	0.0%	Adverse experience absorbed by Defined Benefit contribution increases.
Defined Contribution and Social Security	11.14%	11.45%	68.0%	72.2%	77.6%	-5.9%	Adverse experience absorbed by Defined Contribution benefit. Contributions are fixed.

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> These are contributions at the assumed investment return of 7.5% for defined benefit plans and 5.5% for defined contribution plans. The impacts on these contribution rates of varying the investment returns are discussed in the comments column.

<sup>2</sup> Results are based on investment return changes during the pre-retirement period only. Balances in the cash balance and defined contribution plans have been converted into annuities using 5.5% interest and valuation mortality. PERA’s Money Purchase Annuity is calculated using 7.5% interest and valuation mortality.

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## APPENDIX C

### ASSUMPTIONS

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## APPENDIX C

### ASSUMPTIONS

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#### **Assumptions for Section III, Colorado PERA Hybrid Plan Profile**

- Assumed pay varies by hire age: hire age 25, \$25,000; hire age 40, \$45,000; hire age 55, \$55,000; Judges all ages, \$120,000.
- Salary scales vary by division and composite assumptions are used based on those in the December 31, 2013 PERA Actuarial Valuation Report.
- Participants are assumed to leave their contributions at PERA until age 65, unless otherwise indicated.
- Employee contributions to PERA are assumed to grow at 3% interest per year, as currently credited by PERA.
- Accumulated contributions are converted to a Money Purchase Annuity assuming 100% employer match at retirement eligibility.
- Annuitization of all accumulated contributions to the Money Purchase Annuity used PERA's valuation mortality and 7.5% interest assumption, with no COLA.
- The benefit shown is the greater of the Money Purchase Annuity and Service Retirement Formula for all participants with 5 or more years of service. For less than 5 years of service, the Money Purchase Annuity, but not the Service Retirement Formula, is available to participants.
- The lump sum option for PERA at date of termination is as follows: no employer match for less than 5 years of service, 50% match after 5 or more years of service and 100% match at retirement.
- The State Troopers are part of the State Division. Their benefit eligibilities, contributions, hiring and retirement patterns are different from the State Division and reflect the public safety nature of their job. They have been excluded from this study.

#### **Assumptions for Section V, Comparison of Benefits and Contributions of Current Plan Design to Alternative Plan Designs-New Hire Basis**

- No post-retirement benefit increases in any plans.
- 7.5% annual investment return, net of expenses, and 3 year vesting for the defined benefit portions of the hybrid plans.
- 5.5% annual investment return, net of expenses, for the defined contribution portions of the hybrid plans and the self-directed defined contribution plan.
- Annuitization of all defined contribution plan balances used valuation mortality and 5.5% interest assumption, with no COLA.
- The cost for PERA's current plan new hires was developed by GRS from the 2013 new entrant employer normal cost provided by PERA as follows:

### Total Employer and Employee Normal Cost for New Hires

Division	PERA provided 2013 New Entrant Employer Normal cost	Plus Employee Contribution	Minus Expense Load	Total Employer and Employee Normal Cost for New Hires
<b>State</b>	1.12%	8.05% (State & Troopers)	0.35%	8.82%
<b>Local Government</b>	0.76%	8.0%	0.35%	8.41%
<b>Schools</b>	1.84%	8.0%	0.35%	9.49%
<b>Denver Public Schools</b>	2.44%	8.0%	0.35%	10.09%
<b>Judges</b>	7.64%	8.0%	0.35%	15.29%

Source: Data provided by PERA and summarized by Gabriel, Roeder, Smith & Company.

Two different approaches were used to model the alternative plans: (1) “The Targeted Benefit Approach” assumes that the State wants to keep the ultimate level of expected benefits constant and let the contribution amounts vary; and (2) the “Targeted Contribution Approach” assumes that the State wants to keep the level of contributions constant and let the ultimate level of benefits vary.

Using two different approaches helps ensure the modeling provides an “apples to apples comparison.” Often, when alternative plans are examined, items portrayed as cost differences based on plan design are, in fact, differences based on the level of benefits provided. In other words, a model that allows both the benefits and the contributions to vary at the same time creates an “apples to oranges” comparison. By using two different approaches, GRS’ modeling holds constant either the level of benefits or the level of contributions and allows for a true comparison of the efficiency of providing benefits under each alternative plan.

#### Demographics

Members are expected to receive salary increases consistent with the blended salary scale assumptions developed by GRS from those used in the December 31, 2013 PERA Actuarial Valuation Report, which are based on historical trends of PERA members. The same is true for termination assumptions, retirement patterns, and mortality expectations.

#### Investment Return

It has been assumed that the PERA trust fund would generate 7.5% annual investment returns, net of expenses, matching the assumption used in the December 31, 2013 PERA Actuarial Valuation Report. Self-directed defined contribution accounts would earn 2.0% less than the PERA trust fund, or 5.50% during the member’s accumulation period.

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## APPENDIX D

### DEFINED CONTRIBUTION PLAN CONVERSION AND STUDY OUTCOMES IN THE PUBLIC SECTOR

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## APPENDIX D

### DEFINED CONTRIBUTION PLAN CONVERSION AND STUDY OUTCOMES IN THE PUBLIC SECTOR

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The results of the modeling in this study suggest that while changes in plan structure may shift risk from the employer to the member, they do not engender savings. This, then, raises the question of how plans have achieved savings if not through structural changes. In examining the issue, GRS has determined the following:

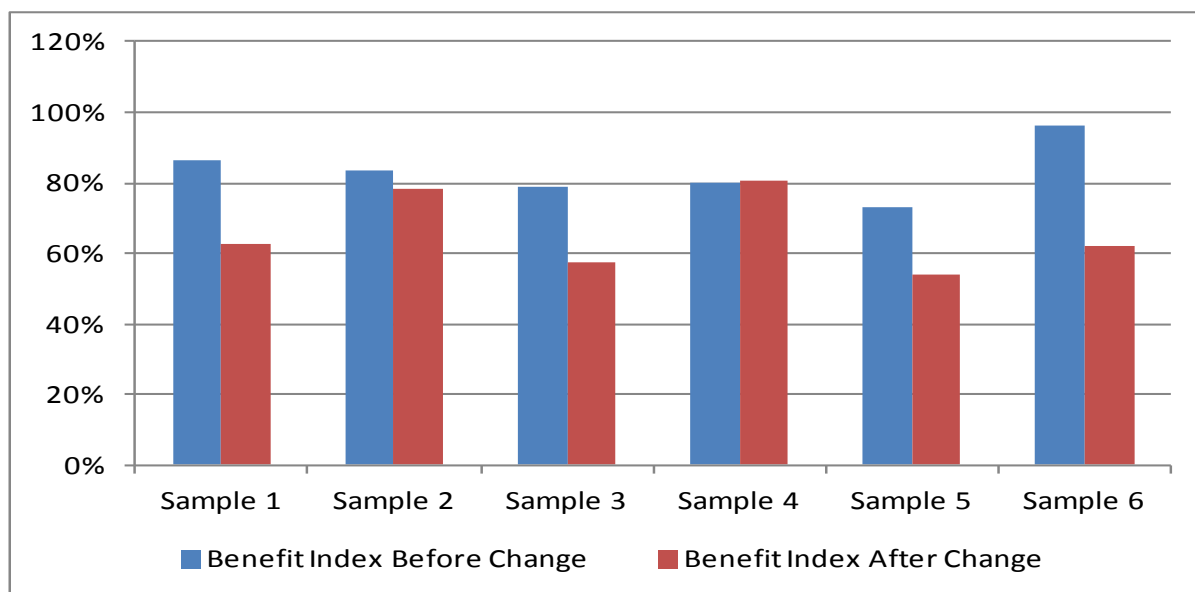
- Other states changing plan structures have lowered benefits to realize savings; and
- While there are cost savings measures available, the PERA Hybrid Plan already incorporates several of the main cost-savings measures undertaken by other states.

First, GRS examined whether plans that undergo structural changes (e.g. moving from a defined benefit plan to an alternative plan) also reduce benefits as part of the change to achieve savings. The study analyzed six statewide plans that recently changed structures to determine if benefits were lowered as part of the structural change, and if so, to what extent. These six plans lowered benefits provided by the employer-sponsored system by 30% as part of moving to an alternative plan. The employer-sponsored system would include any defined contribution portion of the retirement plan.

To ascertain how the level of retirement benefits provided before the changes compare to the benefits provided after the changes, a Relative Benefit Index (Index) was developed that quantifies the differences. An index score of 100 means that a plan provides a benefit with a value equal to full salary replacement and a COLA consistent with Consumer Price Index-Urban (CPI-U) for a career employee.

The following exhibit provides the relative benefit index calculated for each program before and after the change. One plan appears to be an outlier in the amount of benefit reduction, but in fact the member contribution rate was increased by 4.50% to maintain the level of benefit. All of the other sample alternative structures show a lower relative benefit index as a result of the structural changes.

### Benefit Value Before and After Plan Structural Changes



Source: Gabriel, Roeder, Smith & Company

The six plans sampled were Georgia Employees Retirement System, Kansas Public Employees Retirement System, Louisiana State Employees Retirement System, Michigan Public School Employees Retirement System, Rhode Island Employees Retirement System, and Utah Retirement System.

The data from the samples reinforces the finding from the Targeted Benefit Approach analysis for the PERA Hybrid Defined Benefit Plan (PERA Hybrid Plan) because both indicate that plans do not achieve savings by simply moving to a an alternative plan design. Rather, a benefit reduction must accompany such a move in order for the plan to realize savings.

Second, GRS examined which benefit reductions were most common in other states. In May 2012, the National Association of State Retirement Administrators (NASRA) published *“Selected Approved Changes to State Public Pensions to Restore or Preserve Plan Sustainability.”* In the publication, NASRA compiled the major changes in contributions, benefits, and eligibility undertaken by 44 retirement systems for 2010 and 2011. The NASRA publication found the following changes to be prevalent, mostly for new hires:

- 59% of the plans increased normal, early or unreduced retirement ages.
- 41% of the plans eliminated, reduced, or froze their automatic COLAs to achieve savings.
- 27% of the plans lowered the benefit formula multiplier.
- 22% of the plans increased from a 3 to a 5 year final average salary benefit provision.

Other selected states have had similar experiences with their conversions. The following summary highlights those states that have attempted to convert from a defined benefit plan

structure to the defined contribution plan structure. (Summary comments extracted from “Shifting Public Sector DB Plans to DC, The Experience so far and implications for Canada”; Robert L. Brown, PhD, FCIA, FSA, ACAS; Craig McInnes, October 2014).

### **Alaska**

In 2006, Alaska closed its defined benefit plans for teachers and state employees to new hires and instituted a defined contribution retirement plan. In order to replace the lost death and retiree medical benefits, Alaska also instituted a separate death and retiree medical plan for the participants in the new defined contribution retirement plan.

The original intent was to cap the unfunded liability which was then projected to reach \$5.7 billion to \$6.2 billion dollars. Since closing the pension plans to new hires, the unfunded liability has grown to about \$11.9 billion. In 2014 the legislature voted to pay \$3 billion to the plans (\$2 billion to the teachers plan and \$1 billion to the state employees plan).

Employer contribution rates are capped at 22% of payroll, and the difference above that amount is payable by the State. Alaska Teachers does not participate in Social Security.

### **Michigan**

New hires are enrolled in a 401(k) plan, and Michigan employees also participate in Social Security. Michigan closed its existing defined benefit plan to new employees in April, 1997. In the year the defined benefit plan closed to new employees, it was 108% funded. By 2012, that funded ratio was 60.3%, with an unfunded actuarial accrued liability of \$6.2 billion.

The Defined Benefit Plan was funded entirely by employer contributions. In 2012, the state enacted legislation to require Defined Benefit Plan members to either start contributing 4% of pay, or switch to a Defined Contribution Plan. (These requirements were ruled unconstitutional in a case that at the time of this writing was on its way to the Michigan Supreme Court.)

5.5% of the members did elect to switch to the Defined Contribution Plan in 1997. Thirteen years later, those nearing retirement who had stayed in the Defined Benefit Plan were doing better than those in the Defined Contribution Plan. (2011 report Keefe). The average account balance for those 60 or more was \$123,000, which is estimated to produce about \$9,000 per year. In the Defined Benefit Plan, the average benefit for those retiring at the time was about \$30,000.

### **Minnesota**

After the 2008 market downturn, the Minnesota Legislature mandated a study to look at alternative designs for existing public sector retirement plans. The June 2011 study included an actuarial analysis of the costs associated with moving from the existing defined benefit structure

to a Defined Contribution Plan. According to the Mercer analysis, it would cost \$2.76 billion over the following decade to move to a Defined Contribution Plan. In the mid-term costs would be lower, since the accelerated funding for the plan closure brings in more assets that generate greater investment returns. However, since the objective was only to change the structure and not the benefit amount, costs in the long term would be higher. The study stated that because the ongoing “normal cost” of the existing Defined Benefit Plan is less than the cost of a future replacement Defined Contribution Plan, the long term costs would be higher.

In addition, the Minnesota Center for Fiscal Excellence found that the median 401(k) savings for a 30 year private sector employee retiring at 60 was \$74,000. That lump sum could convert to about \$340 per month for 22 years and five months. The public-sector pension plan member could expect \$1,700 per month for life. This paper drew the conclusion that the 401(k) DC plans will leave more Minnesotans employed in the public sector at risk of needing taxpayer-funded public assistance.

Subsequent to the study the Minnesota Legislature passed a bill that:

1. Increased employee and employer contributions;
2. Increased penalties for early retirement;
3. Reduced the COLA until funding ratios improve.

## **Nebraska**

In the 1960's the Nebraska Public Employees Retirement System was a Defined Contribution Plan. In 2002 the state and county employees that were new hires entered into a statewide Cash Balance Plan. Existing employees were given two chances to switch to the new plan, in 2003 and later in 2007. About a third switched each time.

The change to Cash Balance Plans was made after studies comparing retirees in Nebraska school Defined Benefit Plans found they were achieving higher benefits with lower costs than retirees in the Defined Contribution Plans. The studies demonstrated that the Defined Contribution Plans had disproportionately higher administrative costs, lower benefits and lower investment returns compared to statewide Defined Benefit Plans. The 20-year returns average (1982-2002) for the Defined Benefit Plans was 11%, while Defined Contribution Plans earned 6%-7%. (A Review of Defined Benefit, Defined Contribution, and Alternative Retirement Plans 2012)

The switch to Cash Balance Plans has resulted in lower fees and administration costs and reduced the Defined Contribution Plan investment and timing risk for retiring members. (Chambers, 2011)

**Nevada**

In 2010, the Nebraska Public Employees' Retirement System Board commissioned a study to analyze the effects of closing the Defined Benefit Plan to new employees, who would then enter a Defined Contribution Plan. The contribution rates would increase by 10.44% of payroll for regular employees and by 11.44% of payroll for police/fire. That converted to an increase in combined contributions for the employers and employees of \$1.2 billion.

The study also concluded that the difference between expenses and expected return would lead to a difference in net return of 1.5% annually. The result would be that Defined Contribution Plan participants would have retirement assets that were 20% lower than the Defined Benefit Plan participants (The Segal Company, 2010).

**New York City**

This study, titled "A Better Bang for NYC's Buck" looked at the five plans and found that longevity risk pooling in the city's Defined Benefit Plans saves 10%-13% of the cost of providing equivalent benefits under a Defined Contribution Plan; portfolio diversification in the Defined Benefit Plans saves 4%-5% and benefit returns from the Defined Benefit Plans save 21-22%.

On the flip side, the cost to deliver similar benefits was 36%-38% lower than it would be in defined contribution plans. That translates to a finding that it would be 57%-61% more expensive for Defined Contribution Plans to deliver an equivalent level of benefits to those currently provided by the Defined Benefit Plans. ("A Better Bang for NYC's Buck: An Efficiency Comparison of Defined Benefit and Defined Contribution Retirement Savings Plans", Fornia 2011)

**Texas**

Concerns over funding prompted the Texas Legislature to order a study of the effects of potential changes to the plan, including the conversion from a defined benefit to a defined contribution plan. Among the key findings:

1. The Defined Benefit Plan provides benefits at a lower cost than alternative plans;
2. The majority of Texas Retirement System members would do significantly worse investing on their own in a plan with a defined contribution component;
3. Other pension plans moving from defined benefit plans to alternative structures have realized savings, but by only lowering benefits;
4. Setting up an alternative system for new hires will not address existing liabilities.

The study found that there would need to be a 12%-13.8% increase to provide the same replacement ratio through a defined contribution plan. If contributions were kept at the current levels, the alternative plans would provide benefits 27% to 59% of pre-retirement income, versus the 68% (for members retiring at age 62) under the existing Defined Benefit Plan.

While reducing benefits or increasing costs, setting up a new system for new hires would not reduce the existing liabilities and the liquidity requirement of the legacy plan would increase over time, adding \$11.7 billion to the liability.

### **West Virginia**

West Virginia is one of the two states that have changed back from a defined contribution plan to some form of defined benefit plan over concerns about administration costs and low benefits for plan members.

In 1991, a Defined Contribution Plan was established for new hires and 4,500 elected into that plan. By the time, school employees were able to move back to a Defined Benefit Plan in 2008; for teachers over age 60, only 105 of those 1,767 potential retirees (6%) had balances in their individual accounts of more than \$100,000. (Levitz, 2008) For many, the balance in their Defined Contribution Plan was less than one year of benefit payments from the Defined Benefit Plan.

A 2005 study showed that returning to the defined benefit structure could save the State \$1.2 billion over 30 years. Over the 10-year period 2001-2010, Defined Benefit Plan assets earned 3.93% compared to 2.32% for those in the Defined Contribution Plan. (Olleman and Boivie 2011)

### **Wisconsin**

In 2011, Act 32 required the Department of Employee Trust funds to consider studying the structure and benefits provided under the Wisconsin Retirement System (WRS). The Act required the study to address setting up a defined contribution system as an option for employees. The study recommended against making any of those changes. It found that the WRS is already a financially healthy system with low cost to taxpayers. The changes proposed would likely increase costs (to provide similar benefits) or reduce the benefits achievable by plan members. (*This is partly due to higher administration costs and lower investment returns.*) The study also found that many of the advantages often cited for defined contribution plans are already incorporated in the WRS. The WRS has a component for risk sharing that has reduced benefits for many members in every year since the 2008 recession, except for 2013.

WRS annuity adjustments are linked to trust fund investment performance as well. The WRS, by law, does not guarantee post-retirement cost-of-living adjustments (COLAs), a strategy frequently used by other public retirement plans for inflation protection. WRS annuity increases are solely dependent on WRS trust fund investment performance. When there is a shortfall in the annuity reserve, previously granted annuity increases must be recouped from retirees who received them. Conversely, when there is an excess in the annuity reserve, increases can be provided to all. WRS annuities were reduced in 2012 for the fourth year in a row. (from a “A Study of the Wisconsin Retirement System, 2012)

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## APPENDIX E

### OTHER SYSTEM EXAMPLES OF ALTERNATIVE PLANS

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## APPENDIX E

### OTHER SYSTEM EXAMPLES OF ALTERNATIVE PLANS

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#### **Defined Benefit-Defined Contribution Hybrid Plans**

##### Georgia's Employee Retirement System

General state employees covered under Georgia's Employee Retirement System hired after January 1, 2009 are covered under the new hybrid plan while existing members had the option to join the new plan. New hires are automatically enrolled in a Defined Contribution Plan (unless they elect not to participate) and contribute 1.0% of pay, with additional contributions up to 5.0%, all of which are eligible for an employer match. The match is 100% of the first 1.0% of pay contribution and 50% of optional contributions, for a maximum match of 3.0% of pay.

The Defined Benefit Plan will pay 1.0% of the members' final 24-month average salary for each year of service. Members contribute 1.25% of pay to the Defined Benefit Plan and the State contributes an actuarially-determined rate.

The system indicated that the change was driven primarily by the preference of young workers, who constituted over 60% of the state's workforce, for wages over benefits. In response, the state raised wages and introduced a lower cost hybrid plan, with a defined contribution component so that young mobile workers would have a more portable benefit in the event they left state employment.

Members hired after January 1, 2009 have an employer normal cost of 2.98% for the defined benefit portion of the program. Contributions for current unfunded liabilities are in addition to this total, currently about 12.2% of payroll. The members of this program also participate in Social Security, for a total employer contribution of up to 24.38%.

##### Michigan Public School Employees

Public school employees hired after July 1, 2010 automatically contribute 2.0% of pay to the Defined Contribution Plan (unless they elect not to participate), with additional contributions permitted. The sponsor matches 50% of the member's first 2.0% of contributions.

The Defined Benefit Plan for new hires pays 1.50% of the member's final 60-month average salary for each year of service. Members contribute 6.4% of pay to the plan. The accrual rate is the same as it is under the two predecessor Defined Benefit Plans for school employees, but the age and service requirements for this new Defined Benefit Plan have been increased and the cost-of-living adjustments eliminated.

Based on press reports, the future employer costs (including required contributions for retiree health insurance) were a major motivation for the transition to a hybrid plan. Essentially, the new hybrid plan reduces the benefits compared to the existing Defined Benefit Plan, and the Defined Contribution Plan incorporates a very modest contribution from the employer.

Members hired after July 1, 2010 have an employer normal cost of 2.67% for the defined benefit portion of the program. Contributions for current unfunded liabilities are in addition to this total, currently about 17.03% of payroll. The members of this program also participate in Social Security, for a total employer contribution equal to 26.9%. (Alicia H. Munnell, Jean-Pierre Aubry, Josh Hurwitz, and Laura Quinby, April 2011. A Role for Defined Contribution Plans in the Public Sector. State and Local Pension Plans Issue Brief Number 16)

### Utah Retirement System

In 2010, the Utah Retirement System established their Tier II hybrid plan as a result of the State's goals to reduce the State's and employer's exposure to the financial risk that the current program provides. New hires have the choice between a Defined Contribution Plan and a Hybrid Plan, but most importantly, the modification created a capped, defined contribution-type, liability for the employer.

If a new member elects to participate in the Defined Contribution-only Plan, the member will receive a 10% of pay contribution from the State. If a new member elects to participate in the Hybrid Plan, the State will allocate a total of 10% of pay toward the member's retirement benefit. The allocated contribution first goes to pay the Actuarially Required Contribution (ARC) of the Defined Benefit Plan as determined by the actuary. Then, after the ARC is paid, anything remaining from the 10% goes to the Defined Contribution Plan. If the Defined Benefit Plan ARC rises, the first consequence is that defined contributions fall. Further, if the Defined Benefit Plan ARC goes above the State's capped 10% of pay contribution, the defined contributions go to zero and the members must contribute any shortfall.

Stakeholders (State, employers, and employee groups) were able to provide input during the design process. The new design achieved Utah's goal of eliminating the employer's funding risk associated with the delivery of benefits to members in the Tier II benefit program, regardless of the employee's choice for a retirement program.

Contributions for current unfunded liabilities are in addition to this total, currently about 6.3% of payroll. The members of this program also participate in Social Security, for a total employer contribution of 22.5%.

**Cash Balance Plan**Texas Municipal Retirement System

Texas Municipal Retirement System (TMRS) is one of the nation's oldest Cash Balance Plans. A member's basic benefit is calculated based on an accumulated account balance, but investments are not member-directed like Defined Contribution Plans. Plan features include a 5.0% interest credit floor, prior service credits, updated service credit, cost-of-living adjustment options, and a lifetime annuity payable upon retirement.

With a menu of benefit options, the contribution requirements vary widely from employer to employer. In addition, most of the individual plans include public safety personnel. For comparison purposes, the median employer contribution rate is 13.22% and the median investment credit is 8.28%. In addition, most members of this program also participate in Social Security, for a total median employer contribution (pension plus Social Security) of 27.7%.

Nebraska Public Employees Retirement System

Prior to 2003, all employees were enrolled in a Defined Contribution Plan. In response to concerns that employees were not accumulating enough for retirement in their Defined Contribution Plan, the Legislature established a Hybrid Cash Balance Plan for new state and county employees. Existing Defined Contribution Plan participants were given the option to switch to the new Hybrid Plan.

Members contribute 4.8% of salary pre-tax and the state matches contributions at 156% match of member contributions. Also, member accounts receive an "interest credit rate" based on the federal mid-term rate plus 1.5% and are guaranteed a minimum annual rate of return of 5.0%. Members may choose to retire as early as age 55 and the plan provides for multiple payment options of their account at retirement.

The members of this program also participate in Social Security, for a total employer contribution of 21.1%.

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## APPENDIX F

### PRIVATE SECTOR RETIREMENT PLAN TRENDS

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## APPENDIX F

### PRIVATE SECTOR RETIREMENT PLAN TRENDS

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#### *2013 Trends & Experience in Defined Contribution Plans, Aon Hewitt*

- Studied 400 employers in 2013 and concluded that the most popular employer match is \$1.00 for each \$1.00 employee contribution, with a maximum employer match of 6.0%.
- The trend has been to increase this match, since the prior study done in 2011 showed a match of \$0.50 per \$1.00 on the first 6.0%, for a maximum of 3.0%.

#### *Defined Contribution Plans of Fortune 100 Companies for the 2011 Plan Year, Towers Watson, January 2013*

- In 2011, Fortune 100 companies that only offered defined contribution plans averaged an employer contribution rate of 6.2% of pay maximum.

#### *The last private industry pension plans: a visual essay, Monthly Labor Review, December 2012*

- Coverage of all private industry workers fell by almost 50% from 1990 to 2011, from 35% to 18%.
- Trend to freeze private industry defined benefit plans by closing to new entrants or limiting or stopping future accruals has continued. In 2011, 25% of participants in a private industry defined benefit plan are in a frozen plan, compared to 20% in 2009.
- Trend continues toward less coverage for non-union employees. In 1994, 81% of full-time union members had pension coverage and 48% of full-time non-union had coverage. In 2011, 67% of full-time union had coverage and 13% of full-time non-union had coverage.
- Trend has been a decline in overall union coverage and a shift in employment away from union jobs.
- Shift continues toward cash balance and other alternative “nontraditional” defined benefit designs. In 1980, 98% of plans had a defined benefit plan based on salary or fixed dollar formula. In 2010, 61% of plans are traditional defined benefit, 36% are cash balance and 3% are other nontraditional defined benefit plans.

#### *Pension Freezes Continue Among Fortune 1000 Companies in 2010, Towers Watson September 2010*

- Trend to freeze traditional defined benefit plans continues (freeze means stop future accruals for this study). In one year, from 2009 to 2010, the number of companies sponsoring frozen plans increased 4%.
- The number of Fortune 1000 companies that sponsor one or more frozen plans increased from 45 in 2004 to 208 in 2010, from 7% to approximately 36%.
- Only 38% of Fortune 1000 companies maintain a defined benefit plan and have no frozen plans.

- Trend shifting from defined benefit plan to defined contribution plan continues due to financial difficulties, global market competition, reducing risk and regulatory uncertainty regarding nontraditional defined benefit plans.
- Closing defined benefit plan to new entrants continues as a trend. Between 2005 and 2010, the number of companies that closed plans to new hires increased from 25 to 85.
- Defined benefit plan terminations continue with 8 organizations starting or completing the termination process in the last 2 years.

*FAQs about Benefits-Retirement Issues*, Employee Benefit Research Institute

- Shows the continuing historical trend toward more defined contribution and less defined benefit.

Figure 2  
Private-Sector Participants in an Employment-  
Based Retirement Plan, by Plan Type, 1979-2011\*  
(Among Those With a Plan)

	Defined Benefit Only	Defined Contribution Only	Both	Total
1979	62%	16%	22%	100%
1980	60%	17%	23%	100%
1981	57%	19%	23%	100%
1982	50%	22%	28%	100%
1983	45%	23%	32%	100%
1984	41%	24%	35%	100%
1985	37%	28%	35%	100%
1986	37%	30%	33%	100%
1987	37%	33%	30%	100%
1988	36%	33%	31%	100%
1989	33%	36%	31%	100%
1990	29%	38%	33%	100%
1991	29%	40%	31%	100%
1992	26%	43%	30%	100%
1993	24%	43%	33%	100%
1994	22%	47%	31%	100%
1995	20%	50%	30%	100%
1996	17%	50%	33%	100%
1997	13%	54%	33%	100%
1998	14%	55%	31%	100%
1999	14%	58%	28%	100%
2000	14%	60%	26%	100%
2001	14%	60%	26%	100%
2002	12%	61%	27%	100%
2003	12%	61%	27%	100%
2004	10%	63%	27%	100%
2005	10%	65%	25%	100%
2006	9%	66%	26%	100%
2007	6%	68%	26%	100%
2008	7%	67%	26%	100%
2009	7%	67%	27%	100%
2010	7%	69%	24%	100%
2011	7%	69%	24%	100%

Source: U. S. Department of Labor Form 5500 Summaries through 1998. \* EBRI estimates 1999-2010 using Pension Benefit Guaranty Corporation, Current Population Survey, and U.S. Department of Labor data.

*Companies that have changed their Defined Benefit Pension Plans, Pension Rights Center*

- This is a list of employers that have announced significant changes to their defined benefit pension plans since 2005.
- Often the changes relate to freezing benefits, or switching to cash balance or defined contribution.

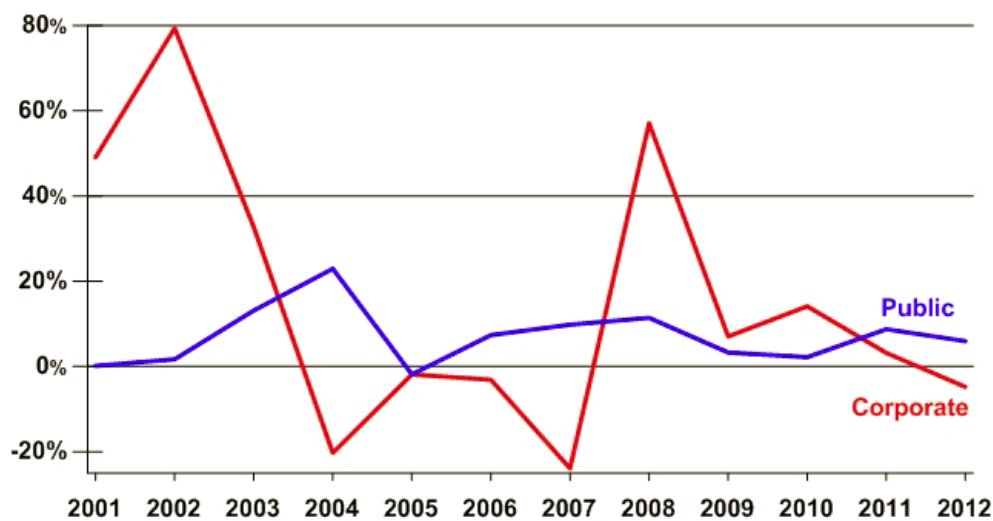
**Recent news on changes to private sector plans**

- *Boeing will freeze pensions for 68,000 nonunion employees*  
The Seattle Times, March 6, 2014. Change to defined contribution only.
- *Lockheed Martin to Freeze Pension Plan for U.S. Based Salaried Employees*  
Lockheed Martin News Release July 1, 2014. Change to defined contribution only.
- *Washington Post announces cuts to employees' retirement benefits*  
Washington Post, September 24, 2014. Change to cash balance plan.
- *Kodak Changing Retirement Plans*  
Democrat and Chronicle, July 30, 2014. Change to cash balance plan.
- *GE Closes DB plan for salaried employees*  
Pension & Investments, January 17, 2011
- *Coca-Cola adopts cash balance pension plan*  
Pension & Investments February 20, 2009

*Public Pension Plan Investment Return Assumptions, NASRA Issue Brief, October 2104*

- Volatility and uncertainly of contribution requirements for private sector plans is a leading factor in corporations modifying, freezing or closing defined benefit pension plans.

**Annual Change in Contributions from prior year in Pension Contributions  
Corporate vs. Public**



Source: Compiled by NASRA based on U.S. Department of Labor and U.S. Census Bureau data

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## APPENDIX G

### SOCIAL SECURITY AND MEDICARE

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## APPENDIX G

### SOCIAL SECURITY AND MEDICARE

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All private sector employees and most public sector employees will receive Social Security benefits. Social Security is a nation-wide social insurance program, providing benefits for retirement, death, and disability. Social Security is funded on a pay-as-you-go basis, meaning, contributions enter and leave the system nearly simultaneously, leaving very little in the trust to earn income.

Members of the Social Security program pay 6.2% of the Social Security wages per year (for purposes of the retirement benefit wages are capped- for 2014 the cap was \$117,000). Members also pay 1.45% of their total wages (these are not capped) for Medicare- and this also includes members of PERA hired after the 1983 Social Security Amendments Act came into effect.

**Retirement-**Social Security provides retirement benefits for members as early as age 62, albeit with an early retirement reduction applied to the benefit amount based on how early the benefit is in receipt prior to the members Social Security retirement age. The full retirement age under Social Security is increasing, and will rise to age 67 for people born in 1960 and later.

**Disability-**Members who become disabled before full retirement age may be eligible to receive disability benefits after six months if the member has enough credits from earnings and has a physical or mental impairment that is expected to prevent the member from doing “substantial” work for a year or more.

**Family-**For members eligible for disability or retirement benefits, that member’s current or divorced spouse, minor children or adult disabled children may also receive benefits. Each may qualify for up to 50% of the member’s benefit amount.

**Survivors-**If a member dies, certain members of the family may be eligible for benefits. For divorced members, the ex-spouses could be eligible for a widow’s or widower’s benefit.

**Retiree Medical-**Medicare, a separate program run by the Centers for Medicare and Medicaid Services, helps pay for inpatient hospital care, nursing care, doctors’ fees, drugs and other medical services and supplies to people age 65 and older.

**Contributions-**Employers and employees alike contribute 6.2% of pay (up to the taxable wage base for the given calendar year) for the retirement benefits. Employers and employees also contribute 1.45% of total pay each year (no cap) to Medicare. In PERA, members contribute 8% of pay, and most members also contribute the additional 1.45% of pay for Medicare.

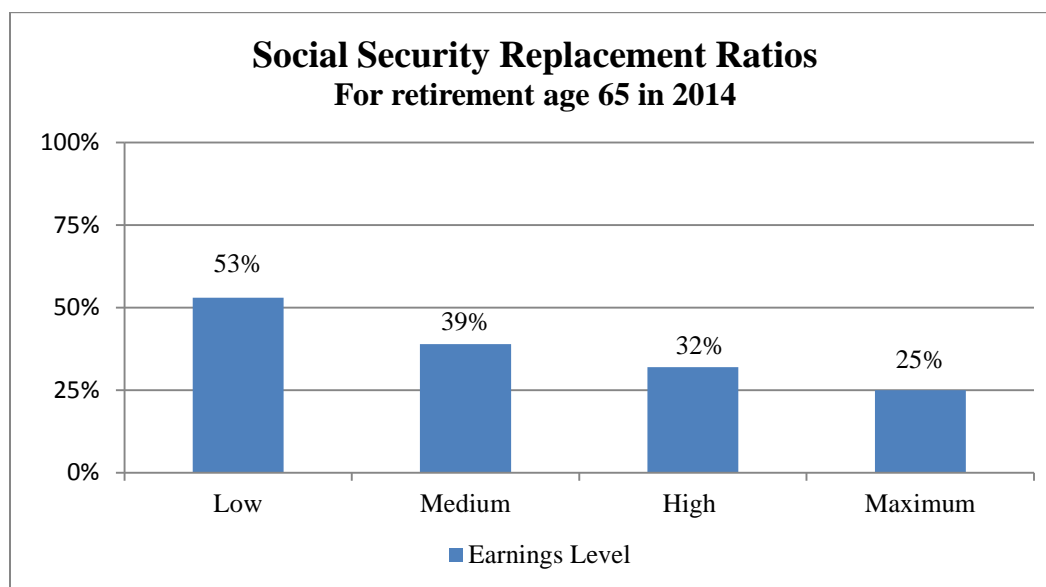
**Price Inflation Protection-**Social Security provides a COLA to its retirees. Each year Social Security announces the COLA amount and then increases the retiree’s checks for the year.

**Government Pension Offset (GPO)**-If a member is receiving a public sector pension and did not pay Social Security taxes and if that same member also qualifies for spouse or survivor benefits, then those benefits are likely to be affected by GPO. If GPO applies, the Social Security benefit will be reduced by an amount equal to two-thirds of the member's government pension, and could be reduced to zero.

**Windfall Elimination Provision (WEP)**-If a member receives a pension from non-Social Security covered employment and also receives a Social Security benefit, the Social Security benefit may be reduced, but not eliminated, by WEP.

When comparing PERA to alternative public sector plans, the comparison included benefits provided under Social Security, since that is the benefit design most commonly found in private sector retirement systems. This study does not suggest that Colorado join Social Security and it is beyond the scope of this study to discuss the implications for the State of Colorado to join Social Security.

Social Security provides varying replacement ratios, depending upon earnings, as shown below. These replacement ratios are for retirements in 2014 and are expected to decline in the future as normal retirement ages increase (due to the fact that for more members, age 65 will become an early retirement age under the Social Security provisions).



Source: The 2014 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, as summarized by Gabriel, Roeder, Smith & Company

For purposes of comparisons in this report, we have assumed the replacement ratios provided by Social Security are for those of a “medium” wage earner, or 39% of final pay, except for Judges, who were assumed to have earned the “maximum” earnings, and therefore have replacement ratios of 25% of final pay.

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## APPENDIX H

### PERA DATA ANALYSIS

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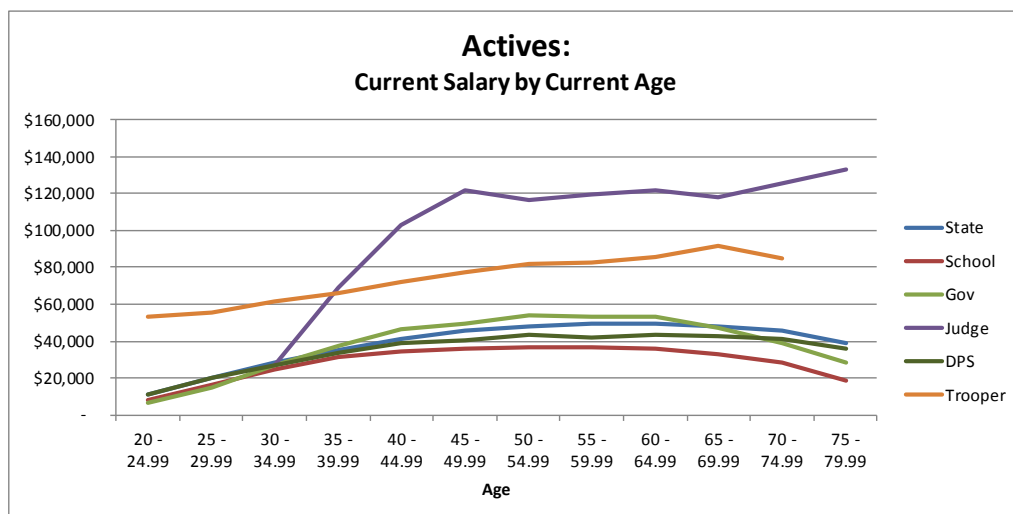
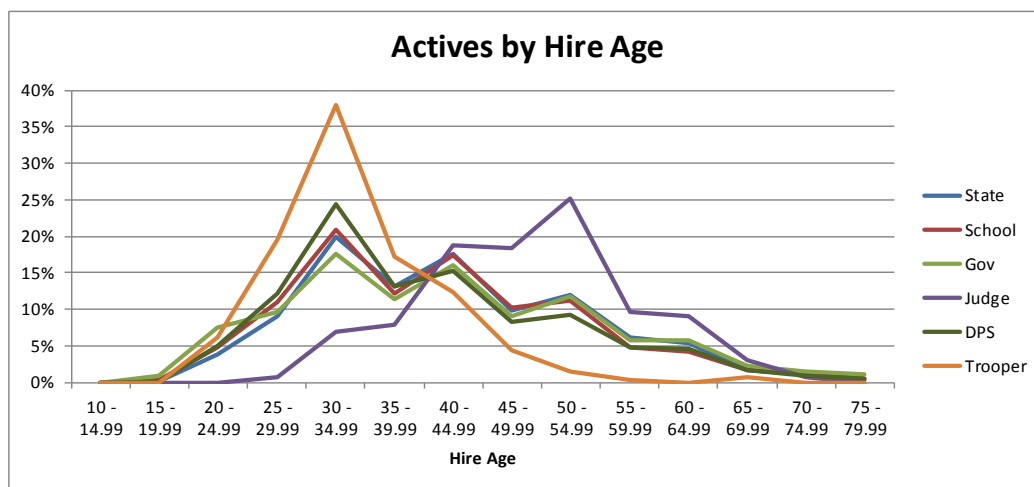
## APPENDIX H

### PERA DATA ANALYSIS

Various sample employee participants were chosen for this study, assuming short-service, mid-service and long-service employees to comply with the requirement to evaluate impacts on PERA employees per 24-51-614-5(a)(IV), C.R.S. The following analysis shows experience for one year only, 2013, of active members, retirees and terminated vested employee trends, broken down by PERA divisions. One thing to keep in mind is that the plan provisions have changed for new hires, so some of these patterns may be related to the grandfathered plan provisions with different eligibilities than those currently in place for new hires.

#### Active Members:

- Actives by hire age
- Current salary by current age
- Average salary by division

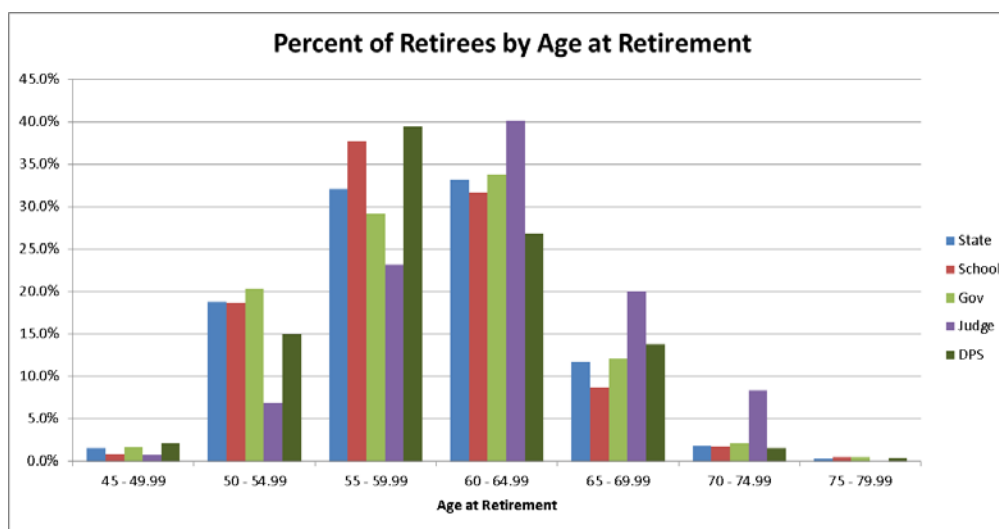
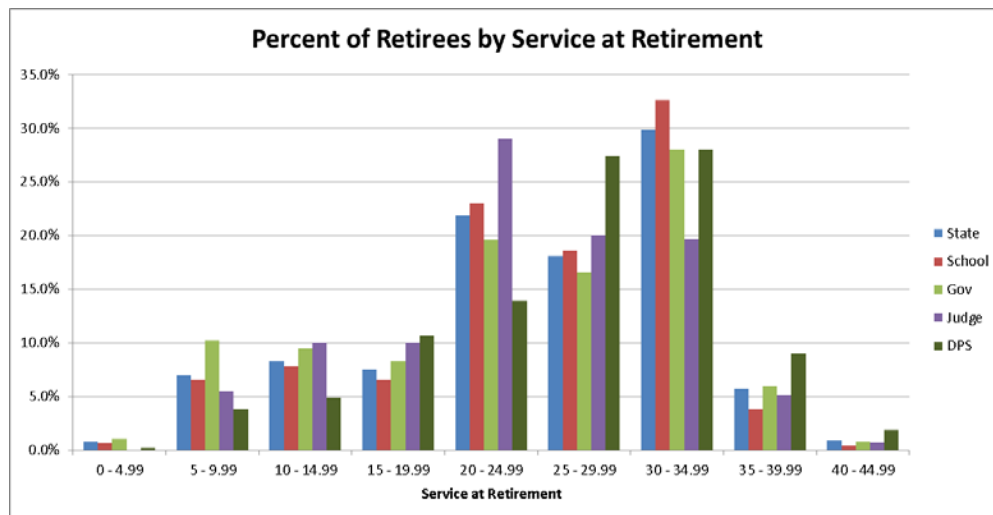


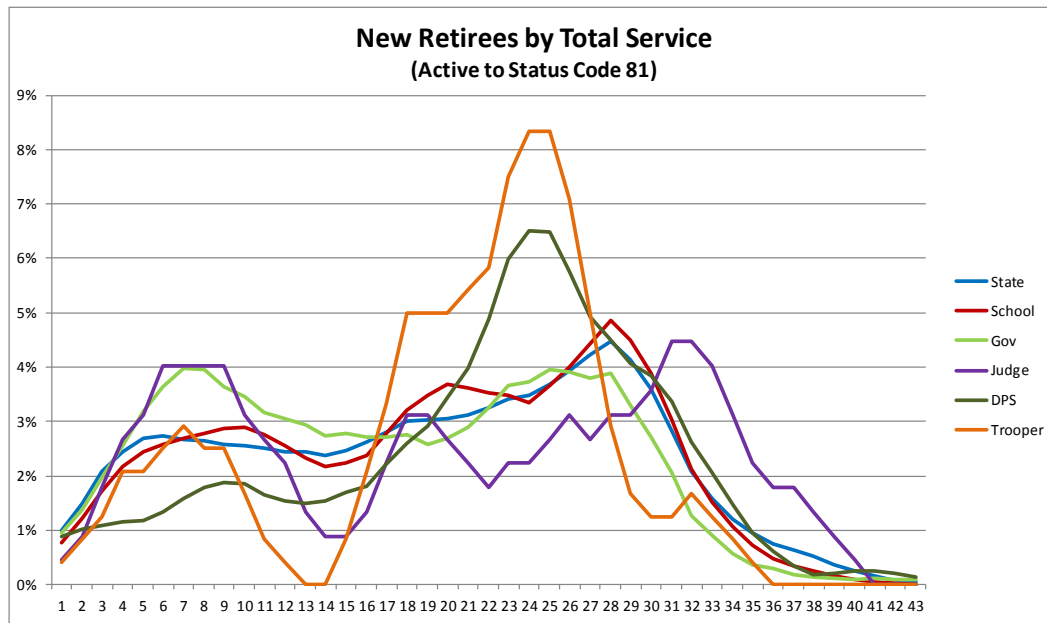
**Actives--Average Salary by Division**

Plan	Average Salary
State	\$ 42,262
School	\$ 32,003
Local Government	\$ 42,391
Judges	\$ 119,449
Denver Public Schools	\$ 34,253
Troopers	\$ 73,833

**Retirees:**

- Percent of all retirees by service at retirement
- Percent of all retirees by age at retirement
- Percent of new retirees in 2013 by service at retirement





#### Averages—Total Service of New Retirees

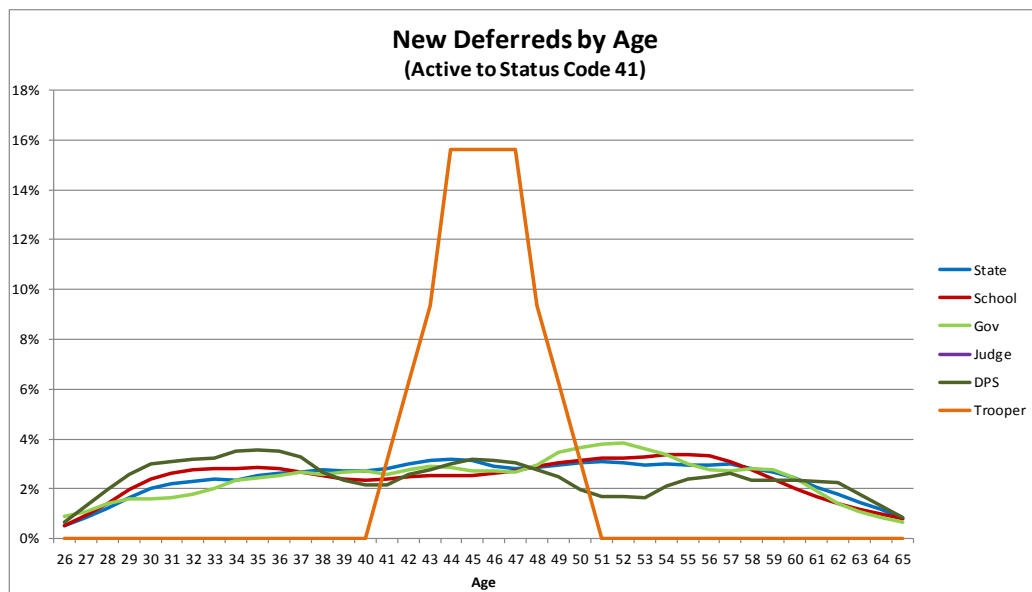
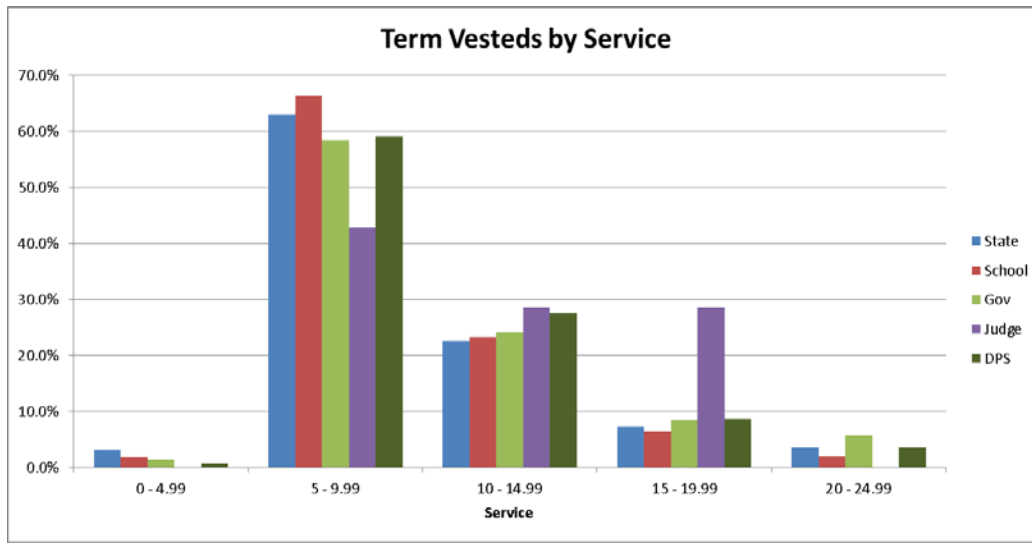
Description	State	School	Local Government	Judge	Denver Public Schools	Trooper
Mean	21	21	19	22	23	22
Median	22	22	20	21	24	25
Mode	30	30	30	6	26	15
Count	1,672	2,936	391	14	338	15

#### Terminated Vested:

- Percent of new 2013 terminated vested choosing a refund of contributions
- Percent of all terminated vested by service at retirement
- Percent of new terminated vested in 2013 by age at retirement

#### Percent of New 2013 Terminated Vested Employees Choosing a Refund

Description	State	School	Local Government	Judge	Denver Public Schools	Trooper
Refund	1,174	1,682	339	0	324	13
Deferred/Retired	2,297	4,707	562	15	508	17
% Refund	34%	26%	38%	0%	39%	43%



### Averages—Ages of New Terminated Vested Employees

Description	State	School	Local Government	Judge	Denver Public Schools	Trooper
Mean	46	46	46	69	45	46
Median	45	47	47	69	44	45
Mode	45	55	43	69	30	44
Count	625	1,771	171	1	170	2

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## APPENDIX I

### ALTERNATIVE PLAN DESIGNS-NEW HIRE BASIS

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## APPENDIX I

### ALTERNATIVE PLAN DESIGNS-NEW HIRE BASIS

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#### **DEFINED BENEFIT AND DEFINED CONTRIBUTION SIDE-BY-SIDE PLAN**

- Provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources.
- Investment and longevity risks are shared between the employee and employer.
- Defined benefit portion of the plan is designed to provide a lifetime annuity.
- Defined contribution portion of the plan provides a portable benefit.
- Death and disability benefits are provided in the defined benefit portion of this plan, but not in the defined contribution plan other than the account balance.
- Systems using a side-by-side defined benefit-defined contribution hybrid plan structure are the Georgia Employee Retirement System and Michigan Public School Employees Retirement System.
- The study modeled a side-by-side hybrid plan in which the state contribution funds the defined benefit portion of the plan and the member contributions fund the defined contribution portion of the plan. The defined benefit portion of the plan offers a 1.50% multiplier and averages the member's 3 highest years of salary.
- The study assumed that the member would have direct investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

#### **CASH BALANCE PLAN**

- Provides members with a "virtual" account to which both the employer and the member contribute a set percentage of wages (pay credits). Pay credits then earn interest at an amount specified in the plan (interest credits).
- Investment and longevity risks are shared between the employee and employer.
- Cash balance account provides a portable benefit.
- Death and disability benefits are provided in this plan.
- Systems using a cash balance plan are the Texas Municipal Retirement System and the Nebraska Public Employees Retirement System.
- The study modeled a cash balance plan similar to Nebraska Public Employees Retirement System, where the member's virtual account is credited with a minimum annual rate of return of 5.0%, or the Federal Mid-term rate plus 1.5% if greater. For these study purposes, 5.0% interest credit was used. The member shares the investment risk during active employment.
- Interest credits can be handled in various ways. For example, a set rate of interest credit, such as 5.5%; an interest credit tied to a yield index at a specific point in time (treasury yields, corporate bonds, etc.); or a credit based on the actual performance of

the trust fund. Minimums and maximums can be applied. For example, the credit could be 2.0% plus 50% of the actual return of the fund. How the investment credit is formulated dictates how much risk is shared between the member and the employer.

- The virtual account can be converted to an annuity at retirement or other options may be made available. As modeled, the account balance is a lump sum amount that is then converted to an annuity using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."
- Annuitizing the plan in this manner means that the employer continues to be exposed to the longevity risk and to the investment risk post-employment.

#### **SELF-DIRECTED DEFINED CONTRIBUTION PLAN**

- Provides a defined contribution plan design with the member and/or employer contributing money to the account. The member does not participate in Social Security.
- Investment and longevity risk are held by the employee.
- Defined contribution account provides a portable benefit.
- Death and disability benefits, other than the account balance, are not provided in this plan.
- Systems using this model are the Colorado PERA Defined Contribution Plan, which offers new State members a choice to join the Defined Contribution Plan when hired without Social Security coverage.
- The study assumed that the member would have direct investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

#### **DEFINED BENEFIT PLUS SOCIAL SECURITY-PRIVATE SECTOR PLAN I**

- Provides a defined benefit in conjunction with Social Security with the goal that both benefits combined will provide adequate retirement resources.
- Investment and longevity risk are held by the employer for the defined benefit plan.
- Defined benefit portion of the plan is designed to provide a lifetime annuity.
- Death and disability benefits are provided in defined benefit plan.
- Social Security portion provides a lifetime annuity with post-retirement cost-of-living increases. Contributions of 6.2% would be made by both employees and employers for Social Security.
- A private employer that used this model is Qwest.
- The study assumed the defined benefit portion of the plan would offer a 1.15% multiplier and average the member's three highest years of salary.

**DEFINED CONTRIBUTION PLUS SOCIAL SECURITY-PRIVATE SECTOR PLAN II**

- Provides a defined contribution benefit in conjunction with mandatory Social Security with the goal that both benefits combined will provide adequate retirement resources.
- Investment and longevity risk are held by the employee for the defined contribution plan.
- Defined contribution portion provides a portable benefit.
- Death and disability benefits are not provided in the defined contribution plan.
- Social Security portion provides a lifetime annuity with post-retirement cost-of-living increases. Contributions of 6.2% would be made by both employees and employers for Social Security.
- A private employer using this model is Comcast.
- The study assumed that the member would have direct investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

Below is a table showing the main features of each design.

Features	Current PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side	Cash Balance Plan	Self-Directed Defined Contribution Plan	Defined Benefit and Social Security – Private Sector Model I	Defined Contribution and Social Security – Private Sector Model II
Plan Type	Defined Benefit only	Defined Benefit and Defined Contribution	Defined Benefit	Defined Contribution	Defined Benefit and Social Security	Defined Contribution and Social Security
Defined Benefit	Fixed. Based on formula of a percent x service x salary, with option to take refund plus match.	Fixed. Based on formula of a percent x service x salary	Variable. Based on a formula of a percent x pay, with interest based on investment earnings	None	Fixed. Based on formula of a percent x service x salary	None
Funding for Defined Benefit	Funded by employer and employee contributions	Funded by employer contributions	Funded by employer and employee contributions	NA	Funded by employer and employee contributions	NA
Defined Contribution Benefit	NA	Variable	NA	Variable	None	Variable
Funding for Defined Contribution	NA	Funded by employee contributions	NA	Funded by employer match and employee contributions	NA	Funded by employer match and employee contributions
Investment Risk	Employer	Shared	Shared	Employee	Employer	Employee
Longevity Risk	Employer	Shared	Shared	Employee	Employer	Shared (due to Social Security)
Social Security	No	No	No	No	Yes	Yes
Portability	Money Purchase account or annuitize at 7.5%	Defined contribution account balance	Cash balance account or annuitize at 5.5%	Defined contribution account balance	None	Defined contribution account balance

Source: Summarized by Gabriel, Roeder, Smith & Company.

## METHODOLOGY

To measure the effectiveness of the PERA Hybrid Plan compared to alternative plans, we looked at it from two perspectives.

- **Targeted Benefit Approach** - First, we set all the benefit levels (replacement ratios) under all plans equal to the benefit level (replacement ratio) under the PERA Hybrid Plan and then estimated the costs, or contribution amounts, needed to provide those benefits under each alternative benefit structure. This was done in order to determine whether there is a more effective benefit structure; one that could provide a similar benefit at a lower cost. This approach for the modeled plans targets the replacement ratio for a full career employee with 30 years of service at age 65, which is 72.2% for PERA Hybrid Plan members (75% for Judges).

- Targeted Contribution Approach.** Second, we held the costs constant under all plans and equal to the normal cost under the PERA Hybrid Plan and looked for a plan that could provide a higher level of benefits for the same cost. This approach keeps the level of contributions equal to the PERA Hybrid Plan contribution rates *for new hires*, since the alternative plans are for new hires, and lets the ultimate level of benefits vary. The cost for new hires as a percent of payroll is the cost for employees hired on or after January 1, 2011, including the plan benefit provisions summarized in Section III and excluding any assumed COLA, consistent with the actuarial valuation assumptions. These employees receive annual increases only to the extent affordable (Colorado PERA's Comprehensive Annual Financial Report (CAFR) for the year ended December 31, 2013), and therefore, the valuation assumes no COLA for these participants. This study makes the same assumption of no COLA when comparing costs of alternative plans. For example, as shown in the table below, the normal cost and targeted contribution amount for the PERA Hybrid Plan State Division new hires is 8.82%, not 26.35%. Any contributions above the new entrant cost of 8.82% go towards paying down the unfunded accrued liability.

The table below shows the current contribution rates, replacement ratios, and estimated costs for PERA Hybrid Plan new hires, as a percent of pay. The costs vary by division due to the different benefit provisions and populations.

PERA Hybrid Plan Replacement Ratio and Estimated Cost for New Hires					
Division	January 1, 2015 Contribution % of Pay <sup>1</sup>	Replacement Ratio % of Pay Target	Estimated Cost for New Hires as % of Pay Target		
	Total Member and Employer	Age 65 and 30 years of service	Employer	Member	Total Member and Employer
State	26.35%	72.2%	0.82%	8.00%	8.82%
Local Government	21.70%	72.2%	0.41%	8.00%	8.41%
Schools	26.35%	72.2%	1.49%	8.00%	9.49%
Denver Public Schools	26.35%	72.2%	2.09%	8.00%	10.09%
Judges	25.36%	75.0%	7.29%	8.00%	15.29%

Source: Information provided by PERA and summarized by Gabriel, Roeder, Smith & Company. See Appendix C for more information on the development of these costs. This estimated total normal cost (annual cost) is the cost for new hires.

<sup>1</sup> Note that PERA's contributions include 1.02% for the Health Care Trust Fund and 1% for the Annual Increase Reserve.

In the sections below we compare the PERA Hybrid Plan to the five alternative plans for Local Government, Schools, Denver Public Schools, and Judicial Divisions.

## Local Government Division Results

### Alternative Plan Analysis

#### Replacement Ratio Analysis, Targeted Benefit and Contribution Studies

#### Defined Benefit and Defined Contribution Side-by-Side Plan

The first alternative plan to be reviewed is the Defined Benefit and Defined Contribution Side-by-Side Plan. This type of plan provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

Comparison of Plan Features Defined Benefit and Defined Contribution Side-by-Side Plan v. PERA Hybrid Defined Benefit Plan	
Defined Benefit and Defined Contribution Side-by-Side Plan	PERA Hybrid Defined Benefit Plan
Provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are shared between the employee and employer.	Investment and longevity risks are held by the employer.
Defined benefit portion of the plan is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution portion of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a side-by-side defined benefit-defined contribution plan structure are the Georgia Employee Retirement System and Michigan Public School Employees Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
The defined benefit plan is assumed to have some degree of ancillary benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit and Defined Contribution Side-by-Side Plan in which the Local Government Division contribution funds the defined benefit portion of the plan and the member contributions fund the defined contribution portion of the plan. The defined benefit portion of the plan offers a 1.50% multiplier and averages the member's 3 highest years of salary. In addition, the study assumed that the member would direct the investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>5.05%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>9.03%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>165%</b>
<b>REPLACEMENT RATIOS (set equal at age 65 with 30 years of service)</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>61.0%</b>
35	60	25	60	<b>49.7%</b>	<b>50.2%</b>
40	60	20	65	<b>39.6%</b>	<b>43.3%</b>
25	45	20	65	<b>20.6%</b>	<b>32.5%</b>
40	50	10	65	<b>13.0%</b>	<b>18.0%</b>
40	43	3	65	<b>4.4%</b>	<b>2.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 3 year's pay; the Employer contributes 5.05% of pay. Defined Contribution Plan: Members contribute 9.03% of pay, the Employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>5.05%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>3.36%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>54.1%</b>
35	62	27	62	<b>62.5%</b>	<b>46.3%</b>
35	60	25	60	<b>49.7%</b>	<b>37.4%</b>
40	60	20	65	<b>39.6%</b>	<b>31.1%</b>
25	45	20	65	<b>20.6%</b>	<b>19.9%</b>
40	50	10	65	<b>13.0%</b>	<b>11.6%</b>
40	43	3	65	<b>4.4%</b>	<b>0.7%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 3 year's pay; the Employer contributes 5.05% of pay. Defined Contribution Plan: Members contribute 3.36% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					



## Cash Balance Plan

The next alternative plan to be reviewed is the Cash Balance Plan. This type of plan functions like a defined contribution plan, building a member's account balance year by year through the addition of mandated employer and employee contributions as well as the addition of a guaranteed rate of return. For this study the Nebraska Cash Balance Plan was used as a model, with the related 5.0% guaranteed rate of return. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Cash Balance Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Cash Balance Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement which may be used to purchase or convert to an annuity with the goal of providing portable benefits and adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment risk is borne by the employer, and there is an "arbitrage" between the assumed rate of return of 7.5% and the guaranteed crediting rate of 5.0%. Longevity risks are borne by the employer if the member elects to annuitize out of the plan.	Investment and longevity risks are held by the employer.
The member may elect to convert his or her account balance to a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution feature of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a cash balance plan structure include Nebraska and the Texas Municipal Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits assumed to be provided by the cash balance plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Cash Balance Plan in which the Local Government Division contribution plus the guaranteed rate of return (5.0%) provides a lump sum at retirement which, when converted to an annuity will replace the 72.2% ratio of the PERA Hybrid Plan age 65 benefit. In addition, the study assumed that the employer would manage the fund and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>8.08%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>188%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>59.1%</b>
35	60	25	60	<b>49.7%</b>	<b>51.7%</b>
40	60	20	65	<b>39.6%</b>	<b>48.8%</b>
25	45	20	65	<b>20.6%</b>	<b>47.0%</b>
40	50	10	65	<b>13.0%</b>	<b>24.9%</b>
40	43	3	65	<b>4.4%</b>	<b>7.5%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash Balance Plan structure with a member contribution of 8%, an employer contribution of 8.08%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				0.41%	0.41%
Member Contribution <sup>2</sup>				8.00%	8.00%
Relative Cost (set equal)				100%	100%
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	25.0%
35	62	27	62	62.5%	20.5%
35	60	25	60	49.7%	17.9%
40	60	20	65	39.6%	16.9%
25	45	20	65	20.6%	16.3%
40	50	10	65	13.0%	8.6%
40	43	3	65	4.4%	2.6%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash Balance Plan structure with a member contribution of 8%, an employer contribution of 0.41%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Self-Directed Defined Contribution Plan

The next alternative plan to be reviewed is the Self-Directed Defined Contribution Plan. This type of plan builds a member's account balance year-by-year through the addition of employee contributions with an employer match and grows with actual investment returns. The member does not participate in Social Security. Colorado PERA Defined Contribution Plan is an example of a system using this model. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Self-Directed Defined Contribution Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Self-Directed Defined Contribution Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement with a goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee.	Investment and longevity risks are held by the employer.
The account balance is the benefit at retirement.	Defined benefit is designed to provide a lifetime annuity.
The vested account balance is portable at time of termination.	A money purchase feature provides a portable benefit option.
A system using a self-directed defined contribution plan structure is Colorado PERA- for those members who elect into PERAChoice.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Self-Directed Defined Contribution Plan and assumed that the employee would direct their investments and earn an annual 5.5% rate of return, and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Self-Directed Defined Contribution Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>13.87%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>254%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.7%</b>
35	60	25	60	<b>49.7%</b>	<b>51.0%</b>
40	60	20	65	<b>39.6%</b>	<b>48.8%</b>
25	45	20	65	<b>20.6%</b>	<b>50.4%</b>
40	50	10	65	<b>13.0%</b>	<b>25.5%</b>
40	43	3	65	<b>4.4%</b>	<b>7.8%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 13.87%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>0.41%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>26.8%</b>
35	62	27	62	<b>62.5%</b>	<b>21.8%</b>
35	60	25	60	<b>49.7%</b>	<b>19.0%</b>
40	60	20	65	<b>39.6%</b>	<b>18.1%</b>
25	45	20	65	<b>20.6%</b>	<b>18.7%</b>
40	50	10	65	<b>13.0%</b>	<b>9.5%</b>
40	43	3	65	<b>4.4%</b>	<b>2.9%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 0.41%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Benefit and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Benefit and Social Security Plan. This plan is very common in the public sector since most statewide plans are defined benefit plans, and all but seven states participate in Social Security. Although rarer, this combination of plans can also be found in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most newer retirees) and have modified the defined benefit plan to meet the targets under the study.

Comparison of Plan Features Defined Benefit Plan and Social Security v. PERA Hybrid Defined Benefit Plan	
Defined Benefit Plan and Social Security	PERA Hybrid Defined Benefit Plan
Provides a defined benefit with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risk are held by the employer in the defined benefit plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risk are held by the employer.
Defined benefit is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
A deferred benefit for a vested terminated member may be available at retirement age; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Nearly all public sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees
Both Social Security and the defined benefit plan provide death and disability benefits.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit Plan and Social Security Plan in which the Local Government Division and the member would contribute to Social Security, and, in addition, the Local Government Division would contribute to a defined benefit plan.

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>10.07%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>190%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>59.8%</b>
35	60	25	60	<b>49.7%</b>	<b>22.9%</b>
40	60	20	65	<b>39.6%</b>	<b>18.2%</b>
25	45	20	65	<b>20.6%</b>	<b>9.5%</b>
40	50	10	65	<b>13.0%</b>	<b>6.0%</b>
40	43	3	65	<b>4.4%</b>	<b>1.3%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional Defined Benefit Plan with a 1.15% multiplier. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					



## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>6.20%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (not possible to set equal)</b>				<b>100%</b>	<b>146%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>39.0%</b>
35	62	27	62	<b>62.5%</b>	<b>31.0%</b>
35	60	25	60	<b>49.7%</b>	<b>0.0%</b>
40	60	20	65	<b>39.6%</b>	<b>0.0%</b>
25	45	20	65	<b>20.6%</b>	<b>0.0%</b>
40	50	10	65	<b>13.0%</b>	<b>0.0%</b>
40	43	3	65	<b>4.4%</b>	<b>0.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security only. Social Security is 146% more expensive than PERA so moving to Social Security will raise costs 46% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit Plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Contribution and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Contribution and Social Security Plan. This plan is very common in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most new retirees) and have modified the defined contribution plan to meet the targets under the study.

Comparison of Plan Features Defined Contribution Plan and Social Security v. PERA Hybrid Defined Benefit Plan	
Defined Contribution Plan and Social Security	PERA Hybrid Defined Benefit Plan
Provides a defined contribution account balance at retirement and a life annuity from Social Security with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee in the defined contribution plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risks are held by the employer.
Defined contribution is designed to provide an account balance at retirement. Social Security is designed to provide a lifetime annuity at retirement.	Defined benefit is designed to provide a lifetime annuity.
The defined contribution balance would be portable at termination; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Many private sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
Social Security provides death and disability benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Contribution and Social Security Plan in which the Local Government Division and the member would contribute to Social Security, and, in addition, the member and Local Government Division would contribute to a defined contribution plan.

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Contribution and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>11.14%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>11.45%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>262%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.1%</b>
35	60	25	60	<b>49.7%</b>	<b>23.6%</b>
40	60	20	65	<b>39.6%</b>	<b>22.5%</b>
25	45	20	65	<b>20.6%</b>	<b>23.2%</b>
40	50	10	65	<b>13.0%</b>	<b>11.8%</b>
40	43	3	65	<b>4.4%</b>	<b>3.6%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional defined contribution plan with a 4.94% employer contribution, a 5.25% member contribution, earnings of 5.5% per year, and an annuity conversion at retirement based on 5.5% and the valuation mortality table. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Local Government Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Local Government Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>0.41%</b>	<b>6.20%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (not possible to set equal)</b>				<b>100%</b>	<b>146%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>39.0%</b>
35	62	27	62	<b>62.5%</b>	<b>31.0%</b>
35	60	25	60	<b>49.7%</b>	<b>0.0%</b>
40	60	20	65	<b>39.6%</b>	<b>0.0%</b>
25	45	20	65	<b>20.6%</b>	<b>0.0%</b>
40	50	10	65	<b>13.0%</b>	<b>0.0%</b>
40	43	3	65	<b>4.4%</b>	<b>0.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security only. Social Security is 146% more expensive than PERA so moving to Social Security will raise costs 46% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## TARGETED BENEFIT APPROACH-Local Government Division-Summary of Findings

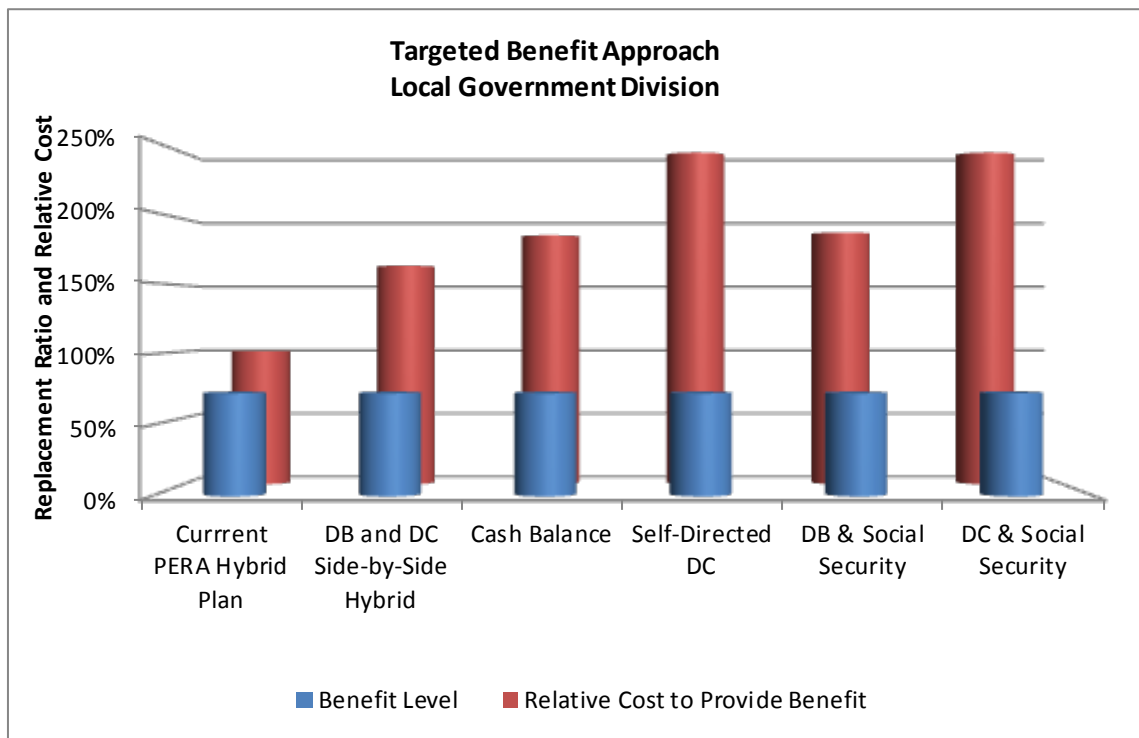
*The study finds that the existing PERA Hybrid Plan provides the current level of benefits at a lower cost than all alternative plans. Therefore, if the State desires to provide the same level of benefits under an alternative plan, then higher contribution rates would be necessary.*

Comparison of Alternative Plans with PERA New Hires						
Targeted Benefit Approach Local Government Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost	Replacement Ratio at Age Target		
				60	62	65
Current PERA Hybrid Plan	0.41%	8.00%	100%	49.7%	62.5%	72.2%
Defined Benefit and Defined Contribution Side by Side Plan	5.05%	9.03%	165%	50.2%	61.0%	72.2%
Cash Balance Plan	8.08%	8.00%	188%	51.7%	59.1%	72.2%
Self-Directed Defined Contribution Plan	13.87%	8.00%	254%	51.0%	58.7%	72.2%
Defined Benefit and Social Security	10.07%	6.20%	190%	22.9% <sup>1</sup>	59.8%	72.2%
Defined Contribution and Social Security	11.14%	11.45%	262%	23.6% <sup>1</sup>	58.1%	72.2%

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> Does not include Social Security benefits since not eligible at age 60.

The blue cylinders in the following figure are the same height, which means the benefits are at the same level for each of the plans. The higher red cylinders show that for the same benefits as the current PERA Hybrid Plan, costs will increase in the alternative plans.



## TARGETED CONTRIBUTION APPROACH –Local Government Division- Summary of Findings

*The study finds that the existing PERA Hybrid Plan provides a higher level of benefit at the current cost than all alternative plans. Therefore, if the State desires to keep the costs the same under an alternative plan, then benefits would need to be reduced.*

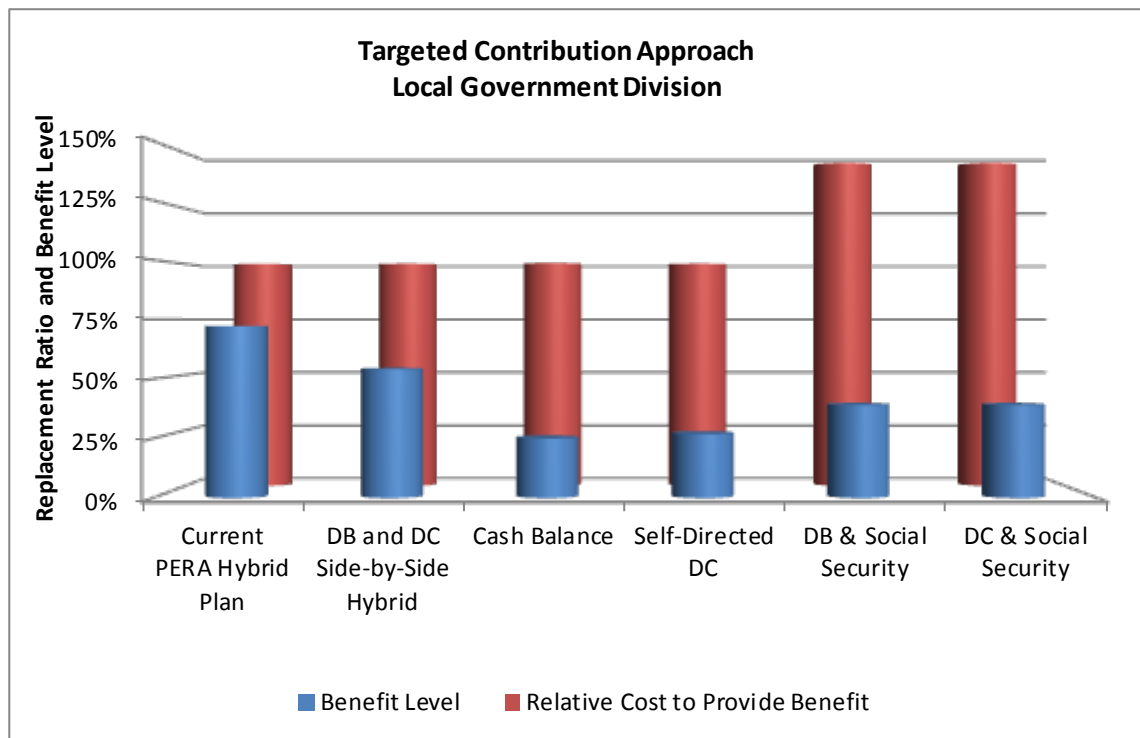
Comparison of Alternative Plans with PERA New Hires						
Targeted Contribution Approach Local Government Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost Target	Replacement Ratio at Age		
				60	62	65
<b>Current PERA Hybrid Plan</b>	<b>0.41%</b>	<b>8.00%</b>	<b>100%</b>	<b>49.7%</b>	<b>62.5%</b>	<b>72.2%</b>
<b>DB and DC Side by Side Plan</b>	<b>5.05%</b>	<b>3.36%</b>	<b>100%</b>	<b>37.4%</b>	<b>46.3%</b>	<b>54.1%</b>
<b>Cash Balance Plan</b>	<b>0.41%</b>	<b>8.00%</b>	<b>100%</b>	<b>17.9%</b>	<b>20.5%</b>	<b>25.0%</b>
<b>Self-Directed Defined Contribution Plan</b>	<b>0.41%</b>	<b>8.00%</b>	<b>100%</b>	<b>19.0%</b>	<b>21.8%</b>	<b>26.8%</b>
<b>Defined Benefit and Social Security</b>	<b>6.20%</b>	<b>6.20%</b>	<b>146%<sup>1</sup></b>	<b>0.0%<sup>2</sup></b>	<b>31.0%</b>	<b>39.0%</b>
<b>Defined Contribution and Social Security</b>	<b>6.20%</b>	<b>6.20%</b>	<b>146%<sup>1</sup></b>	<b>0.0%<sup>2</sup></b>	<b>31.0%</b>	<b>39.0%</b>

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> The cost for Social Security (12.40%) exceeds the current cost of 8.41%. Thus the 146% represents the cost for having Social Security as the sole retirement plan.

<sup>2</sup> Does not include Social Security benefits since not eligible at age 60.

The red cylinders in the following figure are the same height, which means the costs are at the same level for each of the plans, except for the scenarios with Social Security and, since Social Security costs more than PERA the red cylinders must increase. The lower blue cylinders show that for the same costs as the current PERA Hybrid Plan, benefits must be reduced in the alternative plans.



Source: Gabriel, Roeder, Smith & Company.



## Schools Division Results

### Alternative Plan Analysis

#### Replacement Ratio Analysis, Targeted Benefit and Contribution Studies

#### Defined Benefit and Defined Contribution Side-by-Side Plan

The first alternative plan to be reviewed is the Defined Benefit and Defined Contribution Side-by-Side Plan. This type of plan provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

Comparison of Plan Features Defined Benefit and Defined Contribution Side-by-Side Plan v. PERA Hybrid Defined Benefit Plan	
Defined Benefit and Defined Contribution Side-by-Side Plan	PERA Hybrid Defined Benefit Plan
Provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are shared between the employee and employer.	Investment and longevity risks are held by the employer.
Defined benefit portion of the plan is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution portion of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a side-by-side defined benefit-defined contribution plan structure are the Georgia Employee Retirement System and Michigan Public School Employees Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
The defined benefit plan is assumed to have some degree of ancillary benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit and Defined Contribution Side-by-Side Plan in which the Schools Division contribution funds the defined benefit portion of the plan and the member contributions fund the defined contribution portion of the plan. The defined benefit portion of the plan offers a 1.50% multiplier and averages the member's 3 highest years of salary. In addition, the study assumed that the member would direct the investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach School Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>5.69%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>9.27%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>156%</b>
<b>REPLACEMENT RATIOS (set equal at age 65 with 30 years of service)</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>60.9%</b>
35	60	25	60	<b>49.7%</b>	<b>50.1%</b>
40	60	20	65	<b>39.6%</b>	<b>43.4%</b>
25	45	20	65	<b>20.6%</b>	<b>31.3%</b>
40	50	10	65	<b>13.0%</b>	<b>18.8%</b>
40	43	3	65	<b>4.4%</b>	<b>2.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 3 year's pay; the employer contributes 5.69% of pay. Defined Contribution Plan: Members contribute 9.27% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach School Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>5.69%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>3.80%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>55.1%</b>
35	62	27	62	<b>62.5%</b>	<b>47.0%</b>
35	60	25	60	<b>49.7%</b>	<b>38.1%</b>
40	60	20	65	<b>39.6%</b>	<b>31.8%</b>
25	45	20	65	<b>20.6%</b>	<b>20.0%</b>
40	50	10	65	<b>13.0%</b>	<b>12.5%</b>
40	43	3	65	<b>4.4%</b>	<b>0.8%</b>
<p>Source: Gabriel, Roeder, Smith &amp; Company.</p> <p><sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 3 year's pay; the employer contributes 5.69% of pay. Defined Contribution Plan: Members contribute 3.8% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.</p> <p><sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.</p>					

## Cash Balance Plan

The next alternative plan to be reviewed is the Cash Balance Plan. This type of plan functions like a defined contribution plan, building a member's account balance year by year through the addition of mandated employer and employee contributions as well as the addition of a guaranteed rate of return. For this study the Nebraska Cash Balance Plan was used as a model, with the related 5.0% guaranteed rate of return. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Cash Balance Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Cash Balance Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement which may be used to purchase or convert to an annuity with the goal of providing portable benefits and adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment risk is borne by the employer, and there is an "arbitrage" between the assumed rate of return of 7.5% and the guaranteed crediting rate of 5.0%. Longevity risks are borne by the employer if the member elects to annuitize out of the plan.	Investment and longevity risks are held by the employer.
The member may elect to convert his or her account balance to a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution feature of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a cash balance plan structure include Nebraska and the Texas Municipal Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits assumed to be provided by the cash balance plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Cash Balance Plan in which the Schools Division contribution plus the guaranteed rate of return (5.0%) provides a lump sum at retirement which, when converted to an annuity will replace the 72.2% ratio of the PERA Hybrid Plan age 65 benefit. In addition, the study assumed that the employer would manage the fund and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach School Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>8.46%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>171%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.9%</b>
35	60	25	60	<b>49.7%</b>	<b>51.3%</b>
40	60	20	65	<b>39.6%</b>	<b>49.0%</b>
25	45	20	65	<b>20.6%</b>	<b>44.6%</b>
40	50	10	65	<b>13.0%</b>	<b>24.7%</b>
40	43	3	65	<b>4.4%</b>	<b>7.3%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash Balance Plan structure with a member contribution of 8%, an employer contribution of 8.46%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach School Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>1.49%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>27.7%</b>
35	62	27	62	<b>62.5%</b>	<b>22.6%</b>
35	60	25	60	<b>49.7%</b>	<b>19.7%</b>
40	60	20	65	<b>39.6%</b>	<b>18.8%</b>
25	45	20	65	<b>20.6%</b>	<b>17.1%</b>
40	50	10	65	<b>13.0%</b>	<b>9.5%</b>
40	43	3	65	<b>4.4%</b>	<b>2.8%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash Balance Plan structure with a member contribution of 8%, an employer contribution of 1.49%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Self-Directed Defined Contribution Plan

The next alternative plan to be reviewed is the Self-Directed Defined Contribution Plan. This type of plan builds a member's account balance year-by-year through the addition of employee contributions with an employer match and grows with actual investment returns. The member does not participate in Social Security. Colorado PERA Defined Contribution Plan is an example of a system using this model. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Self-Directed Defined Contribution Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Self-Directed Defined Contribution Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement with a goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee.	Investment and longevity risks are held by the employer.
The account balance is the benefit at retirement.	Defined benefit is designed to provide a lifetime annuity.
The vested account balance is portable at time of termination.	A money purchase feature provides a portable benefit option.
A system using a self-directed defined contribution plan structure is Colorado PERA- for those members who elect into PERAChoice.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Self-Directed Defined Contribution Plan and assumed that the employee would direct their investments and earn an annual 5.5% rate of return, and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Self-Directed Defined Contribution Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach School Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>14.43%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>231%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.5%</b>
35	60	25	60	<b>49.7%</b>	<b>50.8%</b>
40	60	20	65	<b>39.6%</b>	<b>49.8%</b>
25	45	20	65	<b>20.6%</b>	<b>46.0%</b>
40	50	10	65	<b>13.0%</b>	<b>25.7%</b>
40	43	3	65	<b>4.4%</b>	<b>7.7%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 14.43%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					



## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach School Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>1.49%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>29.7%</b>
35	62	27	62	<b>62.5%</b>	<b>24.1%</b>
35	60	25	60	<b>49.7%</b>	<b>20.9%</b>
40	60	20	65	<b>39.6%</b>	<b>20.2%</b>
25	45	20	65	<b>20.6%</b>	<b>19.7%</b>
40	50	10	65	<b>13.0%</b>	<b>10.4%</b>
40	43	3	65	<b>4.4%</b>	<b>3.1%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 1.49%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Benefit and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Benefit and Social Security Plan. This plan is very common in the public sector since most statewide plans are defined benefit plans, and all but seven states participate in Social Security. Although rarer, this combination of plans can also be found in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most newer retirees) and have modified the defined benefit plan to meet the targets under the study.

<b>Comparison of Plan Features</b> <b>Defined Benefit Plan and Social Security v. PERA Hybrid Defined Benefit Plan</b>	
<b>Defined Benefit Plan and Social Security</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a defined benefit with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risk are held by the employer in the defined benefit plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risk are held by the employer.
Defined benefit is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
A deferred benefit for a vested terminated member may be available at retirement age; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Nearly all public sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees
Both Social Security and the defined benefit plan provide death and disability benefits.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit Plan and Social Security Plan in which the Schools Division and the member would contribute to Social Security, and, in addition, the Schools would contribute to a defined benefit plan.

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Schools Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>10.57%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>174%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>59.8%</b>
35	60	25	60	<b>49.7%</b>	<b>22.9%</b>
40	60	20	65	<b>39.6%</b>	<b>18.2%</b>
25	45	20	65	<b>20.6%</b>	<b>9.3%</b>
40	50	10	65	<b>13.0%</b>	<b>5.9%</b>
40	43	3	65	<b>4.4%</b>	<b>1.5%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional Defined Benefit Plan with a 1.15% multiplier. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Schools Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				1.49%	6.20%
Member Contribution <sup>2</sup>				8.00%	6.20%
Relative Cost (not possible to set equal)				100%	130%
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	72.2%	39.0%
35	62	27	62	62.5%	31.0%
35	60	25	60	49.7%	0.0%
40	60	20	65	39.6%	0.0%
25	45	20	65	20.6%	0.0%
40	50	10	65	13.0%	0.0%
40	43	3	65	4.4%	0.0%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security only. Social Security is 130% more expensive than PERA so moving to Social Security will raise costs 30% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Contribution and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Contribution and Social Security Plan. This plan is very common in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most new retirees) and have modified the defined contribution plan to meet the targets under the study.

<b>Comparison of Plan Features</b> <b>Defined Contribution Plan and Social Security v. PERA Hybrid Defined Benefit Plan</b>	
<b>Defined Contribution Plan and Social Security</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a defined contribution account balance at retirement and a life annuity from Social Security with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee in the defined contribution plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risks are held by the employer.
Defined contribution is designed to provide an account balance at retirement. Social Security is designed to provide a lifetime annuity at retirement.	Defined benefit is designed to provide a lifetime annuity.
The defined contribution balance would be portable at termination; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Many private sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
Social Security provides death and disability benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Contribution and Social Security Plan in which the Schools Division and the member would contribute to Social Security, and, in addition, the member and Schools Division would contribute to a defined contribution plan.

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Contribution and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Schools Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>11.14%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>11.45%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>233%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.1%</b>
35	60	25	60	<b>49.7%</b>	<b>23.6%</b>
40	60	20	65	<b>39.6%</b>	<b>22.5%</b>
25	45	20	65	<b>20.6%</b>	<b>23.2%</b>
40	50	10	65	<b>13.0%</b>	<b>11.8%</b>
40	43	3	65	<b>4.4%</b>	<b>3.6%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional defined contribution plan with a 4.94% employer contribution, a 5.25% member contribution, earnings of 5.5% per year, and an annuity conversion at retirement based on 5.5% and the valuation mortality table. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Schools Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>1.49%</b>	<b>6.20%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (not possible to set equal)</b>				<b>100%</b>	<b>130%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>39.0%</b>
35	62	27	62	<b>62.5%</b>	<b>31.0%</b>
35	60	25	60	<b>49.7%</b>	<b>0.0%</b>
40	60	20	65	<b>39.6%</b>	<b>0.0%</b>
25	45	20	65	<b>20.6%</b>	<b>0.0%</b>
40	50	10	65	<b>13.0%</b>	<b>0.0%</b>
40	43	3	65	<b>4.4%</b>	<b>0.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security only. Social Security is 130% more expensive than PERA so moving to Social Security will raise costs 30% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit Plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## TARGETED BENEFIT APPROACH-Schools Division-Summary of Findings

*The study finds that the existing PERA Hybrid Plan provides the current level of benefits at a lower cost than all alternative plans. Therefore, if the State desires to provide the same level of benefits under an alternative plan, then higher contribution rates would be necessary.*

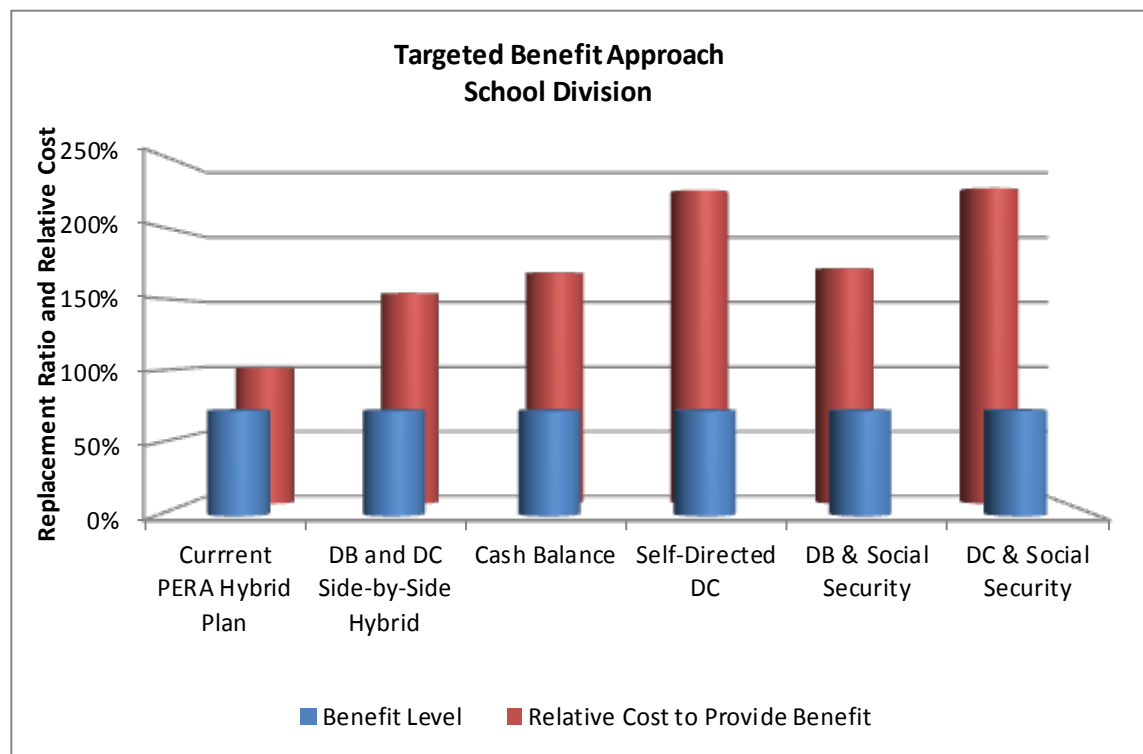
Comparison of Alternative Plans with PERA New Hires						
Targeted Benefit Approach Schools Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost	Replacement Ratio at Age Target		
				60	62	65
Current PERA Hybrid Plan	1.49%	8.00%	100%	49.7%	62.5%	72.2%
Defined Benefit and Defined Contribution Side-by-Side Plan	5.69%	9.27%	156%	50.1%	60.9%	72.2%
Cash Balance Plan	8.46%	8.00%	171%	51.3%	58.9%	72.2%
Self-Directed Defined Contribution Plan	14.43%	8.00%	231%	50.8%	58.5%	72.2%
Defined Benefit and Social Security	10.57%	6.20%	174%	22.9% <sup>1</sup>	59.8%	72.2%
Defined Contribution and Social Security	11.14%	11.45%	233%	23.6% <sup>1</sup>	58.1%	72.2%

Source: Gabriel, Roeder, Smith & Company

<sup>1</sup> Does not include Social Security benefits since not eligible at age 60.

The blue cylinders in the following figure are the same height, which means the benefits are at the same level for each of the plans. The higher red cylinders show that for the same benefits as the current PERA Hybrid Plan, costs will increase in the alternative plans.





Source: Gabriel, Roeder, Smith & Company.

## TARGETED CONTRIBUTION APPROACH –Schools Division-Summary of Findings

*The study finds that the existing PERA Hybrid Plan provides a higher level of benefits at the current cost than all alternative plans. Therefore, if the State desires to keep the costs the same under an alternative plan, then benefits would need to be reduced.*

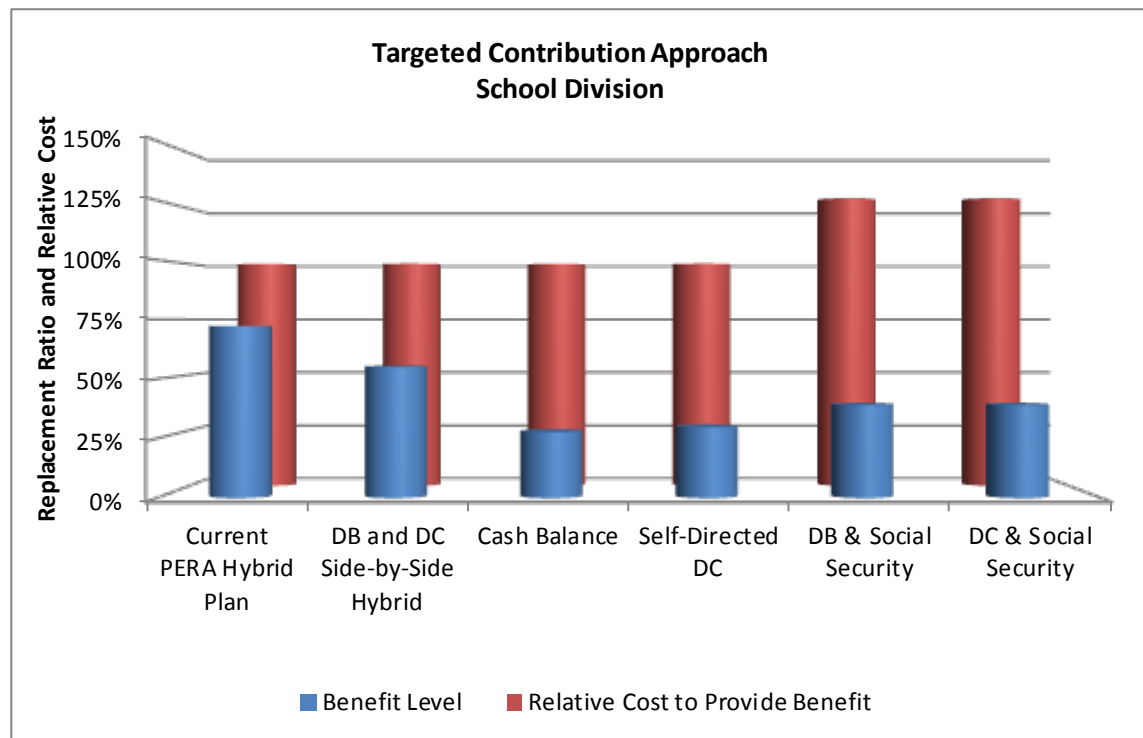
Comparison of Alternative Plans with PERA New Hires						
Targeted Contribution Approach Schools Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost Target	Replacement Ratio at Age		
				60	62	65
Current Defined Benefit Plan	1.49%	8.00%	100%	49.7%	62.5%	72.2%
Defined Benefit and Defined Contribution Side by Side Plan	5.69%	3.80%	100%	38.1%	47.0%	55.1%
Cash Balance Plan	1.49%	8.00%	100%	19.7%	22.6%	27.7%
Self-Directed Defined Contribution Plan	1.49%	8.00%	100%	20.9%	24.1%	29.7%
Defined Benefit and Social Security	6.20%	6.20%	130% <sup>1</sup>	0.0% <sup>2</sup>	31.0%	39.0%
Defined Contribution and Social Security	6.20%	6.20%	130% <sup>1</sup>	0.0% <sup>2</sup>	31.0%	39.0%

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> The cost for Social Security (12.40%) exceeds the current cost of 9.49%. Thus, the 130% represents the cost for having Social Security as the sole retirement plan.

<sup>2</sup> Does not include Social Security benefits since not eligible at age 60.

The red cylinders in the following figure are the same height, which means the costs are at the same level for each of the plans, except for the scenarios with Social Security and, since Social Security costs more than PERA, the red cylinders must increase for these plans. The lower blue cylinders show that for the same costs as the current PERA Hybrid Plan, benefits must be reduced in the alternative plans.



Source: Gabriel, Roeder, Smith & Company.

## Denver Public Schools Division Results

### Alternative Plan Analysis

#### Replacement Ratio Analysis, Targeted Benefit and Contribution Studies

#### Defined Benefit and Defined Contribution Side-by-Side Plan

The first alternative plan to be reviewed is the Defined Benefit and Defined Contribution Side-by-Side Plan. This type of plan provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

Comparison of Plan Features Defined Benefit and Defined Contribution Side-by-Side Plan v. PERA Hybrid Defined Benefit Plan	
Defined Benefit and Defined Contribution Side-by-Side Plan	PERA Hybrid Defined Benefit Plan
Provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are shared between the employee and employer.	Investment and longevity risks are held by the employer.
Defined benefit portion of the plan is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution portion of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a side-by-side defined benefit-defined contribution plan structure are the Georgia Employee Retirement System and Michigan Public School Employees Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
The defined benefit plan is assumed to have some degree of ancillary benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit and Defined Contribution Side-by-Side Plan in which the Denver Public Schools Division contribution funds the defined benefit portion of the plan and the member contributions fund the defined contribution portion of the plan. The defined benefit portion of the plan offers a 1.50% multiplier and averages the member's 3 highest years of salary. In addition, the study assumed that the member would direct the investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>6.05%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>9.27%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>150%</b>
<b>REPLACEMENT RATIOS (set equal at age 65 with 30 years of service)</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>60.9%</b>
35	60	25	60	<b>49.7%</b>	<b>50.1%</b>
40	60	20	65	<b>39.6%</b>	<b>43.4%</b>
25	45	20	65	<b>20.6%</b>	<b>31.3%</b>
40	50	10	65	<b>13.0%</b>	<b>18.8%</b>
40	43	3	65	<b>4.4%</b>	<b>2.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 3 year's pay; the employer contributes 6.05% of pay. Defined Contribution Plan: Members contribute 9.27% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>6.05%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>4.04%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>55.7%</b>
35	62	27	62	<b>62.5%</b>	<b>47.5%</b>
35	60	25	60	<b>49.7%</b>	<b>38.5%</b>
40	60	20	65	<b>39.6%</b>	<b>32.2%</b>
25	45	20	65	<b>20.6%</b>	<b>20.4%</b>
40	50	10	65	<b>13.0%</b>	<b>12.7%</b>
40	43	3	65	<b>4.4%</b>	<b>0.9%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 3 year's pay; the employer contributes 6.05% of pay. Defined Contribution Plan: Members contribute 4.04% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Cash Balance Plan

The next alternative plan to be reviewed is the Cash Balance Plan. This type of plan functions like a defined contribution plan, building a member's account balance year by year through the addition of mandated employer and employee contributions as well as the addition of a guaranteed rate of return. For this study the Nebraska Cash Balance Plan was used as a model, with the related 5.0% guaranteed rate of return. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

Comparison of Plan Features Cash Balance Plan v. PERA Hybrid Defined Benefit Plan	
Cash Balance Plan	PERA Hybrid Defined Benefit Plan
Provides a lump sum at retirement which may be used to purchase or convert to an annuity with the goal of providing portable benefits and adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment risk is borne by the employer, and there is an "arbitrage" between the assumed rate of return of 7.5% and the guaranteed crediting rate of 5.0%. Longevity risks are borne by the employer if the member elects to annuitize out of the plan.	Investment and longevity risks are held by the employer.
The member may elect to convert his or her account balance to a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution feature of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a cash balance plan structure include Nebraska and the Texas Municipal Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits assumed to be provided by the cash balance plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Cash Balance Plan in which the Denver Public Schools Division contribution plus the guaranteed rate of return (5.0%) provides a lump sum at retirement which, when converted to an annuity will replace the 72.2% ratio of the PERA Hybrid Plan age 65 benefit. In addition, the study assumed that the employer would manage the fund and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>8.46%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>161%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.9%</b>
35	60	25	60	<b>49.7%</b>	<b>51.3%</b>
40	60	20	65	<b>39.6%</b>	<b>49.0%</b>
25	45	20	65	<b>20.6%</b>	<b>44.6%</b>
40	50	10	65	<b>13.0%</b>	<b>24.7%</b>
40	43	3	65	<b>4.4%</b>	<b>7.3%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash balance plan structure with a member contribution of 8%, an employer contribution of 8.46%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					



## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>2.09%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>29.4%</b>
35	62	27	62	<b>62.5%</b>	<b>24.0%</b>
35	60	25	60	<b>49.7%</b>	<b>20.9%</b>
40	60	20	65	<b>39.6%</b>	<b>20.0%</b>
25	45	20	65	<b>20.6%</b>	<b>18.2%</b>
40	50	10	65	<b>13.0%</b>	<b>10.1%</b>
40	43	3	65	<b>4.4%</b>	<b>3.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash balance plan structure with a member contribution of 8%, an employer contribution of 2.09%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Self-Directed Defined Contribution Plan

The next alternative plan to be reviewed is the Self-Directed Defined Contribution Plan. This type of plan builds a member's account balance year-by-year through the addition of employee contributions with an employer match and grows with actual investment returns. The member does not participate in Social Security. Colorado PERA Defined Contribution Plan is an example of a system using this model. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Self-Directed Defined Contribution Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Self-Directed Defined Contribution Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement with a goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee.	Investment and longevity risks are held by the employer.
The account balance is the benefit at retirement.	Defined benefit is designed to provide a lifetime annuity.
The vested account balance is portable at time of termination.	A money purchase feature provides a portable benefit option.
A system using a self-directed defined contribution plan structure is Colorado PERA- for those members who elect into PERAChoice.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Self-Directed Defined Contribution Plan and assumed that the employee would direct their investments and earn an annual 5.5% rate of return, and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Self-Directed Defined Contribution Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>14.43%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>218%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.5%</b>
35	60	25	60	<b>49.7%</b>	<b>50.8%</b>
40	60	20	65	<b>39.6%</b>	<b>49.8%</b>
25	45	20	65	<b>20.6%</b>	<b>46.0%</b>
40	50	10	65	<b>13.0%</b>	<b>25.7%</b>
40	43	3	65	<b>4.4%</b>	<b>7.7%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 14.43%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>2.09%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>31.5%</b>
35	62	27	62	<b>62.5%</b>	<b>25.6%</b>
35	60	25	60	<b>49.7%</b>	<b>22.2%</b>
40	60	20	65	<b>39.6%</b>	<b>20.9%</b>
25	45	20	65	<b>20.6%</b>	<b>21.4%</b>
40	50	10	65	<b>13.0%</b>	<b>11.0%</b>
40	43	3	65	<b>4.4%</b>	<b>3.3%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-Directed Defined Contribution Plan structure with a member contribution of 8%, an employer contribution of 2.09%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Benefit and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Benefit and Social Security Plan. This plan is very common in the public sector since most statewide plans are defined benefit plans, and all but seven states participate in Social Security. Although rarer, this combination of plans can also be found in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most newer retirees) and have modified the defined benefit plan to meet the targets under the study.

<b>Comparison of Plan Features</b> <b>Defined Benefit Plan and Social Security v. PERA Hybrid Defined Benefit Plan</b>	
<b>Defined Benefit Plan and Social Security</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a defined benefit with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risk is held by the employer in the defined benefit plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risk are held by the employer.
Defined benefit is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
A deferred benefit for a vested terminated member may be available at retirement age; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers).	A money purchase feature provides a portable benefit option.
Nearly all public sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees
Both Social Security and the defined benefit plan provide death and disability benefits.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit Plan and Social Security Plan in which the Denver Public Schools Division and the member would contribute to Social Security, and, in addition, the Denver Public Schools would contribute to a defined benefit plan.

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>10.84%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>167%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>59.8%</b>
35	60	25	60	<b>49.7%</b>	<b>22.9%</b>
40	60	20	65	<b>39.6%</b>	<b>18.2%</b>
25	45	20	65	<b>20.6%</b>	<b>9.3%</b>
40	50	10	65	<b>13.0%</b>	<b>5.9%</b>
40	43	3	65	<b>4.4%</b>	<b>1.5%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional Defined Benefit Plan with a 1.15% multiplier. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Denver Public Schools Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>6.20%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (not possible to set equal)</b>				<b>100%</b>	<b>122%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>39.0%</b>
35	62	27	62	<b>62.5%</b>	<b>31.0%</b>
35	60	25	60	<b>49.7%</b>	<b>0.0%</b>
40	60	20	65	<b>39.6%</b>	<b>0.0%</b>
25	45	20	65	<b>20.6%</b>	<b>0.0%</b>
40	50	10	65	<b>13.0%</b>	<b>0.0%</b>
40	43	3	65	<b>4.4%</b>	<b>0.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security only. Social Security is 122% more expensive than PERA so moving to Social Security will raise costs 22% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Contribution and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Contribution and Social Security Plan. This plan is very common in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most new retirees) and have modified the defined contribution plan to meet the targets under the study.

Comparison of Plan Features Defined Contribution Plan and Social Security v. PERA Hybrid Defined Benefit Plan	
Defined Contribution Plan and Social Security	PERA Hybrid Defined Benefit Plan
Provides a defined contribution account balance at retirement and a life annuity from Social Security with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee in the defined contribution plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risks are held by the employer.
Defined contribution is designed to provide an account balance at retirement. Social Security is designed to provide a lifetime annuity at retirement.	Defined benefit is designed to provide a lifetime annuity.
The defined contribution balance would be portable at termination; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Many private sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
Social Security provides death and disability benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Contribution and Social Security Plan in which the Denver Public Schools Division and the member would contribute to Social Security, and, in addition, the member and Denver Public Schools Division would contribute to a defined contribution plan.



## Denver Public Schools

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Contribution and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>11.14%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>11.45%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>220%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>72.2%</b>
35	62	27	62	<b>62.5%</b>	<b>58.1%</b>
35	60	25	60	<b>49.7%</b>	<b>23.6%</b>
40	60	20	65	<b>39.6%</b>	<b>22.5%</b>
25	45	20	65	<b>20.6%</b>	<b>23.2%</b>
40	50	10	65	<b>13.0%</b>	<b>11.8%</b>
40	43	3	65	<b>4.4%</b>	<b>3.6%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional defined contribution plan with a 4.94% employer contribution, a 5.25% member contribution, earnings of 5.5% per year, and an annuity conversion at retirement based on 5.5% and the valuation mortality table. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Denver Public Schools

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Denver Public School Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>2.09%</b>	<b>6.20%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (not possible to set equal)</b>				<b>100%</b>	<b>122%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>72.2%</b>	<b>39.0%</b>
35	62	27	62	<b>62.5%</b>	<b>31.0%</b>
35	60	25	60	<b>49.7%</b>	<b>0.0%</b>
40	60	20	65	<b>39.6%</b>	<b>0.0%</b>
25	45	20	65	<b>20.6%</b>	<b>0.0%</b>
40	50	10	65	<b>13.0%</b>	<b>0.0%</b>
40	43	3	65	<b>4.4%</b>	<b>0.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security only. Social Security is 122% more expensive than PERA so moving to Social Security will raise costs 22% and, under this study, no additional plan may be considered (since the objective is to keep the contributions equal to those under the PERA Hybrid Defined Benefit plan.) For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## TARGETED BENEFIT APPROACH-Denver Public Schools Division- Summary of Findings

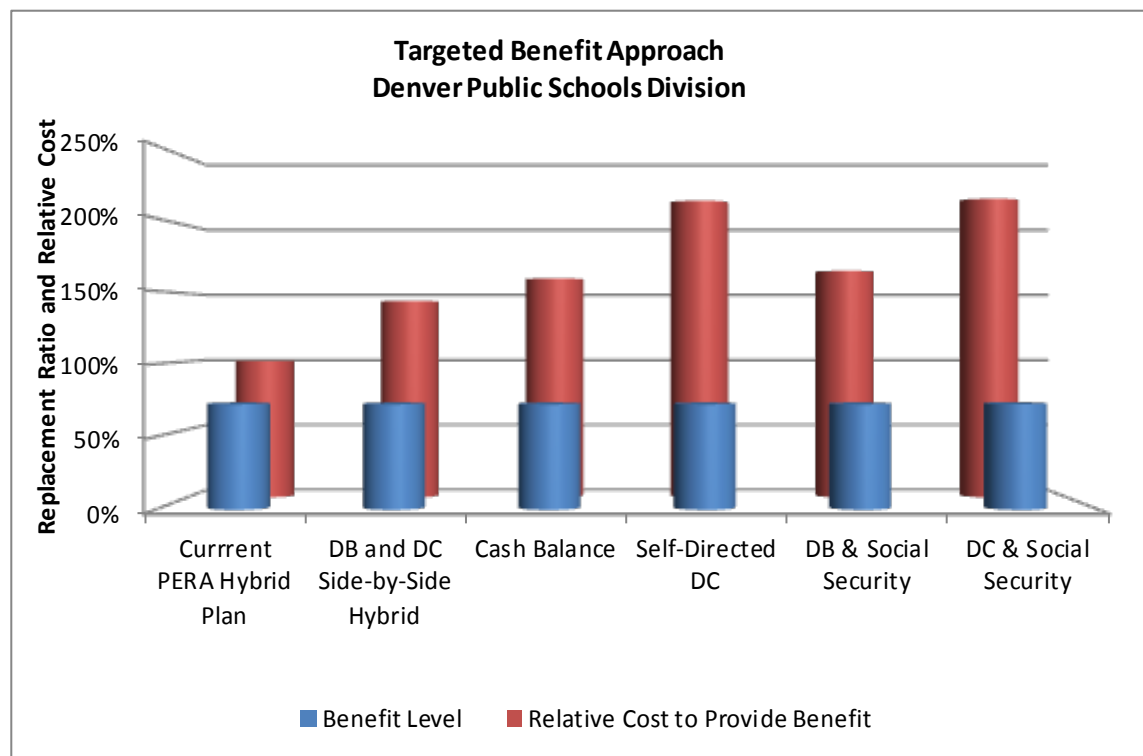
*The study finds that the existing PERA Hybrid Plan provides the current level of benefits at a lower cost than all alternative plans. Therefore, if the State desires to provide the same level of benefits under an alternative plan, then higher contribution rates would be necessary.*

Comparison of Alternative Plans with PERA New Hires						
Targeted Benefit Approach Denver Public Schools Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost	Replacement Ratio at Age Target		
				60	62	65
Current PERA Hybrid Plan	2.09%	8.00%	100%	49.7%	62.5%	72.2%
Defined Benefit and Defined Contribution Side by Side Plan	6.05%	9.27%	150%	50.1%	60.9%	72.2%
Cash Balance Plan	8.46%	8.00%	161%	51.3%	58.9%	72.2%
Self-Directed Defined Contribution Plan	14.43%	8.00%	218%	50.8%	58.5%	72.2%
Defined Benefit and Social Security	10.84%	6.20%	167%	22.9% <sup>1</sup>	59.8%	72.2%
Defined Contribution and Social Security	11.14%	11.45%	220%	23.6% <sup>1</sup>	58.1%	72.2%

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> Does not include Social Security benefits since not eligible at age 60.

The blue cylinders in the following figure are the same height, which means the benefits are at the same level for each of the plans. The higher red cylinders show that for the same benefits as the current PERA Hybrid Plan, costs will increase in the alternative plans.



Source: Gabriel, Roeder, Smith & Company.

## TARGETED CONTRIBUTION APPROACH –Denver Public School Division- Summary of Findings

*The study finds that the existing PERA Hybrid Plan provides a higher level of benefits at the current cost than all alternative plans. Therefore, if the State desires to keep the costs the same under an alternative plan, then benefits would need to be reduced.*

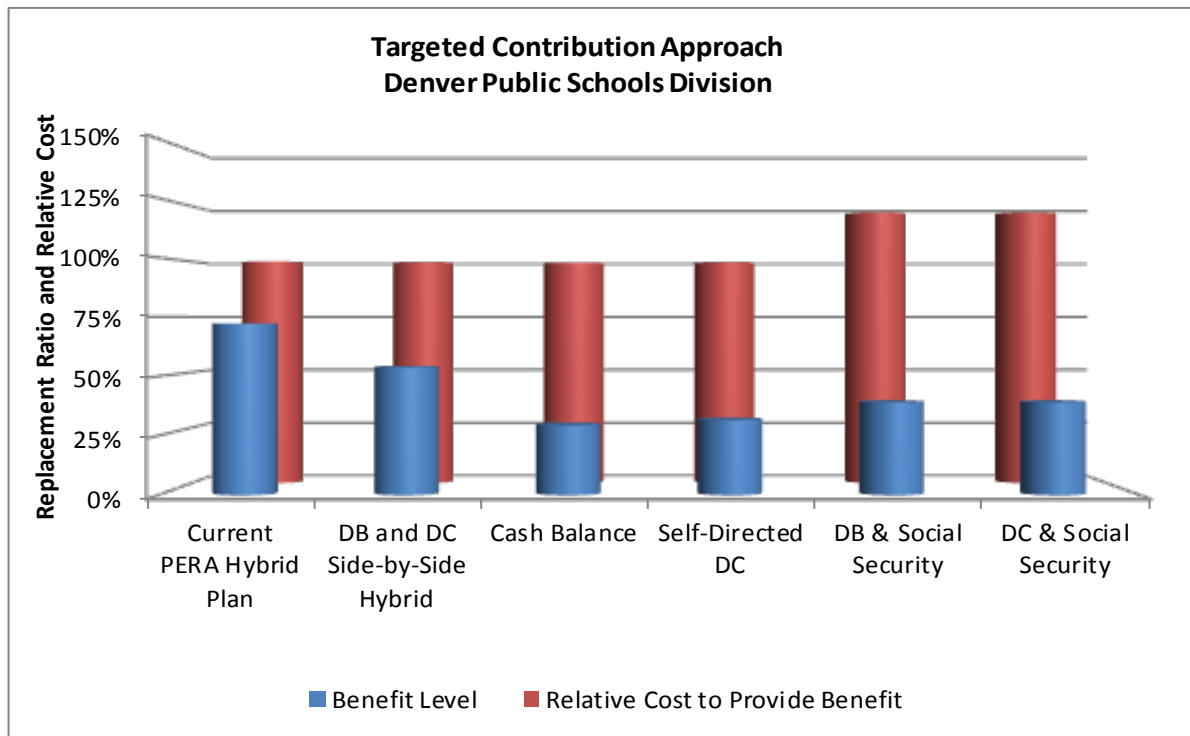
Comparison of Alternative Plans with PERA New Hires						
Targeted Contribution Approach Denver Public School Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost Target	Replacement Ratio at Age		
				60	62	65
<b>Current PERA Hybrid Plan</b>	<b>2.09%</b>	<b>8.00%</b>	<b>100%</b>	<b>49.7%</b>	<b>62.5%</b>	<b>72.2%</b>
<b>Defined Benefit and Defined Contribution Side by Side Plan</b>	<b>6.05%</b>	<b>4.04%</b>	<b>100%</b>	<b>38.5%</b>	<b>47.5%</b>	<b>55.7%</b>
<b>Cash Balance Plan</b>	<b>2.09%</b>	<b>8.00%</b>	<b>100%</b>	<b>20.9%</b>	<b>24.0%</b>	<b>29.4%</b>
<b>Self-Directed Defined Contribution Plan</b>	<b>2.09%</b>	<b>8.00%</b>	<b>100%</b>	<b>22.2%</b>	<b>25.6%</b>	<b>31.5%</b>
<b>Defined Benefit and Social Security</b>	<b>6.20%</b>	<b>6.20%</b>	<b>122%<sup>1</sup></b>	<b>0.0%<sup>2</sup></b>	<b>31.0%</b>	<b>39.0%</b>
<b>Defined Contribution and Social Security</b>	<b>6.20%</b>	<b>6.20%</b>	<b>122%<sup>1</sup></b>	<b>0.0%<sup>2</sup></b>	<b>31.0%</b>	<b>39.0%</b>

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup>The cost for Social Security (12.40%) exceeds the current cost of 10.09%. Thus the 122% represents the cost for having Social Security as the sole retirement plan.

<sup>2</sup> Does not include Social Security benefits since not eligible at age 60.

The red cylinders in the following figure are the same height, which means the costs are at the same level for each of the plans, except for the scenarios with Social Security and, since Social Security costs more than PERA the red cylinders must increase. The lower blue cylinders show that for the same costs as the current PERA Hybrid Plan, benefits must be reduced in the alternative plans.



Source: Gabriel, Roeder, Smith & Company.

## Judicial Division Results

### Alternative Plan Analysis

#### Replacement Ratio Analysis, Targeted Benefit and Contribution Studies

#### Defined Benefit and Defined Contribution Side-by-Side Plan

The first alternative plan to be reviewed is the Defined Benefit and Defined Contribution Side-by-Side Plan. This type of plan provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

Comparison of Plan Features Defined Benefit and Defined Contribution Side-by-Side Plan v. PERA Hybrid Defined Benefit Plan	
Defined Benefit and Defined Contribution Side-by-Side Plan	PERA Hybrid Defined Benefit Plan
Provides a smaller defined benefit and defined contribution benefit with the goal that both benefits combined will provide adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are shared between the employee and employer.	Investment and longevity risks are held by the employer.
Defined benefit portion of the plan is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution portion of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a side-by-side defined benefit-defined contribution plan structure are the Georgia Employee Retirement System and Michigan Public School Employees Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
The defined benefit plan is assumed to have some degree of ancillary benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit and Defined Contribution Side-by-Side Plan in which the Judicial Division contribution funds the defined benefit portion of the plan and the member contributions fund the defined contribution portion of the plan. The defined benefit portion of the plan offers a 1.50% multiplier and averages the member's 3 highest years of salary. In addition, the study assumed that the member would direct the investment of the contributions and convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality

assumed in the December 31, 2013, “Report on the Actuarial Valuation of the Public Employees’ Retirement Association of Colorado.”

### Judicial Division Replacement Ratio Comparisons Assuming Similar Targeted Benefits at age 65

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
Employer Contribution <sup>2</sup>				7.29%	9.17%
Member Contribution <sup>2</sup>				8.00%	9.50%
Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)				100%	122%
REPLACEMENT RATIOS (set equal at age 65 with 30 years of service)					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	75.0%	75.0%
35	62	27	62	65.0%	63.6%
35	60	25	60	51.7%	52.6%
40	60	20	65	40.3%	44.2%
25	45	20	65	21.1%	34.9%
40	50	10	65	13.1%	18.4%
40	43	3	65	3.5%	2.1%
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 1 year’s pay; the employer contributes 9.17% of pay. Defined Contribution Plan: Members contribute 9.5% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					



## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Defined Contribution Side-by-Side Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>9.17%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.12%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>64.0%</b>
35	62	27	62	<b>65.0%</b>	<b>54.6%</b>
35	60	25	60	<b>51.7%</b>	<b>44.7%</b>
40	60	20	65	<b>40.3%</b>	<b>36.9%</b>
25	45	20	65	<b>21.1%</b>	<b>26.8%</b>
40	50	10	65	<b>13.1%</b>	<b>14.5%</b>
40	43	3	65	<b>3.5%</b>	<b>1.3%</b>
Source: Gabriel, Roeder, Smith & Company. <sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 1.50% of final 1 year's pay; the employer contributes 9.17% of pay. Defined Contribution Plan: Members contribute 6.12% of pay, the employer contributes 0% of pay, the fund earns 5.5% return each year; the account balance at age 65 is converted to a lifetime annuity based on 5.5% and the valuation mortality table. <sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Cash Balance Plan

The next alternative plan to be reviewed is the Cash Balance Plan. This type of plan functions like a defined contribution plan, building a member's account balance year by year through the addition of mandated employer and employee contributions as well as the addition of a guaranteed rate of return. For this study the Nebraska Cash Balance Plan was used as a model, with the related 5.0% guaranteed rate of return. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Cash Balance Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Cash Balance Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement which may be used to purchase or convert to an annuity with the goal of providing portable benefits and adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment risk is borne by the employer, and there is an "arbitrage" between the assumed rate of return of 7.5% and the guaranteed crediting rate of 5.0%. Longevity risks are borne by the employer if the member elects to annuitize out of the plan.	Investment and longevity risks are held by the employer.
The member may elect to convert his or her account balance to a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
Defined contribution feature of the plan provides a portable benefit.	A money purchase feature provides a portable benefit option.
Systems using a cash balance plan structure include Nebraska and the Texas Municipal Retirement System.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits assumed to be provided by the cash balance plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Cash Balance Plan in which the Judicial Division contribution plus the guaranteed rate of return (5.0%) provides a lump sum at retirement which, when converted to an annuity will replace the 72.2% ratio of the PERA Hybrid Plan age 65 benefit. In addition, the study assumed that the employer would manage the fund and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>8.93%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age-65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>110%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>75.0%</b>
35	62	27	62	<b>65.0%</b>	<b>62.2%</b>
35	60	25	60	<b>51.7%</b>	<b>54.8%</b>
40	60	20	65	<b>40.3%</b>	<b>50.1%</b>
25	45	20	65	<b>21.1%</b>	<b>52.0%</b>
40	50	10	65	<b>13.1%</b>	<b>25.8%</b>
40	43	3	65	<b>3.5%</b>	<b>7.9%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash balance plan structure with a member contribution of 8%, an employer contribution of 8.93%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Cash Balance Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Cash Balance Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>7.29%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>45.8%</b>
35	62	27	62	<b>65.0%</b>	<b>38.0%</b>
35	60	25	60	<b>51.7%</b>	<b>33.5%</b>
40	60	20	65	<b>40.3%</b>	<b>30.6%</b>
25	45	20	65	<b>21.1%</b>	<b>31.7%</b>
40	50	10	65	<b>13.1%</b>	<b>15.7%</b>
40	43	3	65	<b>3.5%</b>	<b>4.8%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Cash balance plan structure with a member contribution of 8%, an employer contribution of 7.29%, interest crediting to the member's account of 5%, and actual fund earnings of 7.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Self-Directed Defined Contribution Plan

The next alternative plan to be reviewed is the Self-Directed Defined Contribution Plan. This type of plan builds a member's account balance year-by-year through the addition of employee contributions with an employer match and grows with actual investment returns. The member does not participate in Social Security. Colorado PERA Defined Contribution Plan is an example of a system using this model. Following is a summary of the plan features, compared with the PERA Hybrid Plan.

<b>Comparison of Plan Features</b> <b>Self-Directed Defined Contribution Plan v. PERA Hybrid Defined Benefit Plan</b>	
<b>Self-Directed Defined Contribution Plan</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a lump sum at retirement with a goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee.	Investment and longevity risks are held by the employer.
The account balance is the benefit at retirement.	Defined benefit is designed to provide a lifetime annuity.
The vested account balance is portable at time of termination.	A money purchase feature provides a portable benefit option.
A system using a self-directed defined contribution plan structure is Colorado PERA- for those members who elect into PERAChoice.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
There are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Self-Directed Defined Contribution Plan and assumed that the employee would direct their investments and earn an annual 5.5% rate of return, and the member may convert the account balance to an annuity, using assumptions of a 5.5% discount rate and the mortality assumed in the December 31, 2013, "Report on the Actuarial Valuation of the Public Employees' Retirement Association of Colorado."

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Self-Directed Defined Contribution Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>15.09%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>150%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>75.0%</b>
35	62	27	62	<b>65.0%</b>	<b>61.8%</b>
35	60	25	60	<b>51.7%</b>	<b>54.2%</b>
40	60	20	65	<b>40.3%</b>	<b>50.1%</b>
25	45	20	65	<b>21.1%</b>	<b>55.7%</b>
40	50	10	65	<b>13.1%</b>	<b>26.4%</b>
40	43	3	65	<b>3.5%</b>	<b>8.2%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-directed defined contribution plan structure with a member contribution of 8%, an employer contribution of 15.09%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Contribution Side-by-Side Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Self-Directed Defined Contribution Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>7.29%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>8.00%</b>
<b>Relative Cost (set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>49.2%</b>
35	62	27	62	<b>65.0%</b>	<b>40.5%</b>
35	60	25	60	<b>51.7%</b>	<b>35.5%</b>
40	60	20	65	<b>40.3%</b>	<b>32.8%</b>
25	45	20	65	<b>21.1%</b>	<b>36.5%</b>
40	50	10	65	<b>13.1%</b>	<b>17.3%</b>
40	43	3	65	<b>3.5%</b>	<b>5.4%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Self-directed defined contribution plan structure with a member contribution of 8%, an employer contribution of 7.29%, and interest earnings of 5.5%. At retirement, the account balance converts based on 5.5% and the valuation mortality table.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Benefit and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Benefit and Social Security Plan. This plan is very common in the public sector since most statewide plans are defined benefit plans, and all but seven states participate in Social Security. Although rarer, this combination of plans can also be found in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most newer retirees) and have modified the defined benefit plan to meet the targets under the study.

<b>Comparison of Plan Features</b> <b>Defined Benefit Plan and Social Security v. PERA Hybrid Defined Benefit Plan</b>	
<b>Defined Benefit Plan and Social Security</b>	<b>PERA Hybrid Defined Benefit Plan</b>
Provides a defined benefit with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risk are held by the employer in the defined benefit plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risk are held by the employer.
Defined benefit is designed to provide a lifetime annuity.	Defined benefit is designed to provide a lifetime annuity.
A deferred benefit for a vested terminated member may be available at retirement age; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Nearly all public sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees
Both Social Security and the defined benefit plan provide death and disability benefits.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Gabriel, Roeder, Smith & Company.

The study modeled a Defined Benefit Plan and Social Security Plan in which the Judicial Division and the member would contribute to Social Security, and, in addition, the Judicial Division would contribute to a defined benefit plan.



## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>16.41%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>147%</b>
REPLACEMENT RATIOS					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>75.0%</b>
35	62	27	62	<b>65.0%</b>	<b>63.3%</b>
35	60	25	60	<b>51.7%</b>	<b>34.5%</b>
40	60	20	65	<b>40.3%</b>	<b>26.9%</b>
25	45	20	65	<b>21.1%</b>	<b>14.1%</b>
40	50	10	65	<b>13.1%</b>	<b>8.8%</b>
40	43	3	65	<b>3.5%</b>	<b>1.9%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional defined benefit plan with a 1.67% multiplier (a higher multiplier is needed for the Judges Division to get to the target benefit). Both members and employer contribute 6.2% to Social Security. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Defined Benefit and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>9.09%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (Set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>39.4%</b>
35	62	27	62	<b>65.0%</b>	<b>32.3%</b>
35	60	25	60	<b>51.7%</b>	<b>9.9%</b>
40	60	20	65	<b>40.3%</b>	<b>7.7%</b>
25	45	20	65	<b>21.1%</b>	<b>4.1%</b>
40	50	10	65	<b>13.1%</b>	<b>2.5%</b>
40	43	3	65	<b>3.5%</b>	<b>1.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Defined benefit plan multiplier of 0.48% of final 1 year's pay (a lower multiplier is needed for the Judges Division to stay at the contribution level) ; the employer contributes 2.89% of pay. Both members and employer contribute 6.2% to Social Security. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Defined Contribution and Social Security; “Private Sector”

The next alternative plan to be reviewed is the Defined Contribution and Social Security Plan. This plan is very common in the private sector. Social Security has a set contribution rate and a set benefit structure. For this analysis we have assumed an age 65 retirement date (which under Social Security will be an early retirement for most new retirees) and have modified the defined contribution plan to meet the targets under the study.

Comparison of Plan Features Defined Contribution Plan and Social Security v. PERA Hybrid Defined Benefit Plan	
Defined Contribution Plan and Social Security	PERA Hybrid Defined Benefit Plan
Provides a defined contribution account balance at retirement and a life annuity from Social Security with the goal of providing adequate retirement resources.	Provides a defined benefit with the goal of providing adequate retirement resources.
Investment and longevity risks are held by the employee in the defined contribution plan, and by the Federal Government/Social Security for the Social Security program.	Investment and longevity risks are held by the employer.
Defined contribution is designed to provide an account balance at retirement. Social Security is designed to provide a lifetime annuity at retirement.	Defined benefit is designed to provide a lifetime annuity.
The defined contribution balance would be portable at termination; Social Security eligibility follows the member from employer to employer (except for the few non-participating public sector employers.)	A money purchase feature provides a portable benefit option.
Many private sector entities use this benefit structure.	Systems using a similar defined benefit plan without Social Security coverage are Louisiana State Employees Retirement System and Nevada Regular Employees.
Social Security provides death and disability benefits; there are no ancillary benefits provided by the defined contribution plan other than the member's account balance.	Ancillary benefits such as death and disability benefits are also provided in this plan.

Source: Information summarized by Gabriel, Roeder, Smith & Company.

The study modeled a Defined Contribution and Social Security Plan in which the Judicial Division and the member would contribute to Social Security, and, in addition, the member and Judicial Division would contribute to a defined contribution plan.

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Benefits at Age 65

Comparison of Defined Contribution and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Benefit Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>13.58%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>14.05%</b>
<b>Relative Cost (to replace the same age- 65 benefits as under the PERA Hybrid Defined Benefit Plan)</b>				<b>100%</b>	<b>179%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>75.0%</b>
35	62	27	62	<b>65.0%</b>	<b>60.4%</b>
35	60	25	60	<b>51.7%</b>	<b>35.2%</b>
40	60	20	65	<b>40.3%</b>	<b>32.7%</b>
25	45	20	65	<b>21.1%</b>	<b>36.4%</b>
40	50	10	65	<b>13.1%</b>	<b>17.2%</b>
40	43	3	65	<b>3.5%</b>	<b>5.3%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional defined contribution plan with a 7.38% employer contribution, a 7.85% member contribution, earnings of 5.5% per year and an annuity conversion at retirement based on 5.5% and the valuation mortality table. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## Judicial Division

### Replacement Ratio Comparisons Assuming Similar Targeted Contributions

Comparison of Defined Benefit and Defined Benefit and Social Security Plan with PERA Hybrid Defined Benefit Plan					
Targeted Contribution Approach Judicial Division					
				PERA Hybrid Defined Benefit Plan	Defined Contribution and Social Security Plan <sup>1</sup>
<b>Employer Contribution<sup>2</sup></b>				<b>7.29%</b>	<b>9.09%</b>
<b>Member Contribution<sup>2</sup></b>				<b>8.00%</b>	<b>6.20%</b>
<b>Relative Cost (Set equal)</b>				<b>100%</b>	<b>100%</b>
<b>REPLACEMENT RATIOS</b>					
Age at Hire	Age at Termination	Years of Service	Benefit Commencement Age		
35	65	30	65	<b>75.0%</b>	<b>34.5%</b>
35	62	27	62	<b>65.0%</b>	<b>27.6%</b>
35	60	25	60	<b>51.7%</b>	<b>6.7%</b>
40	60	20	65	<b>40.3%</b>	<b>7.0%</b>
25	45	20	65	<b>21.1%</b>	<b>6.3%</b>
40	50	10	65	<b>13.1%</b>	<b>3.3%</b>
40	43	3	65	<b>3.5%</b>	<b>1.0%</b>
Source: Gabriel, Roeder, Smith & Company.					
<sup>1</sup> Features of the Alternative Plan: Social Security participation and an additional defined contribution plan with a 2.89% employer contribution, earnings of 5.5% per year and an annuity conversion at retirement based on 5.5% and the valuation mortality table. For termination ages less than age 62, the Social Security replacement ratio is shown as 0.0%.					
<sup>2</sup> Contribution amounts are calculated as a percentage of employee salary.					

## TARGETED BENEFIT APPROACH-Judicial Division-Summary of Findings

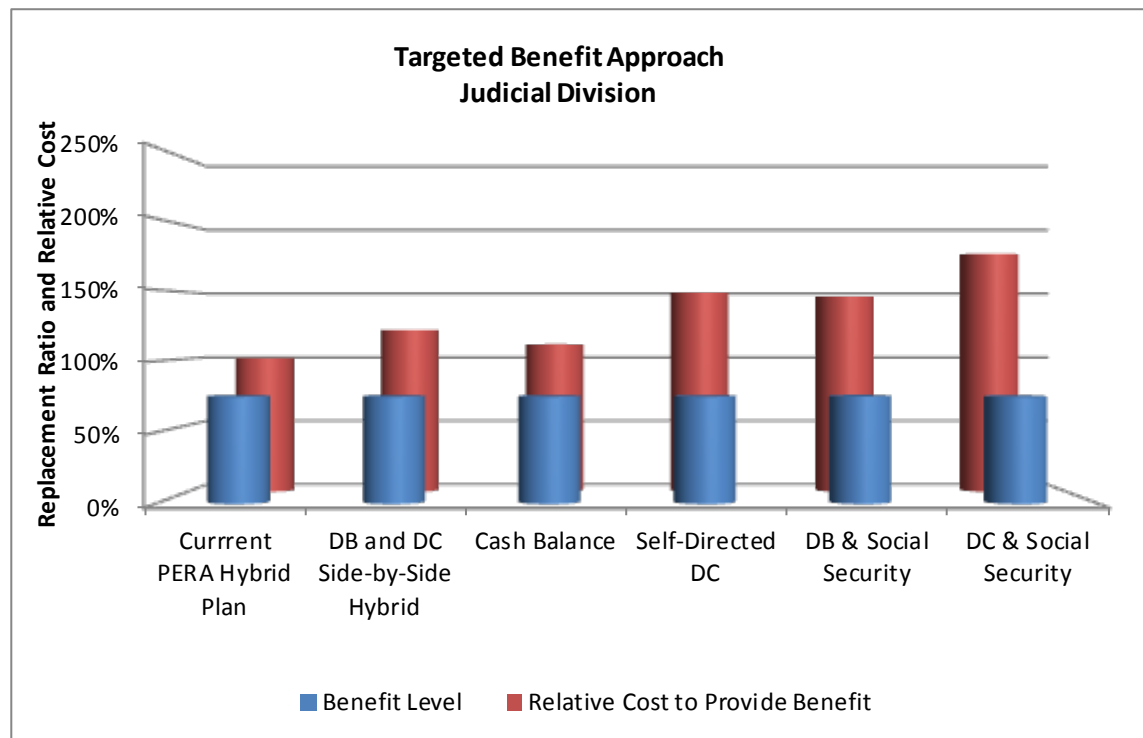
*The study finds that the existing PERA Hybrid Plan provides the current level of benefits at a lower cost than all alternative plans. Therefore, if the State desires to provide the same level of benefits under an alternative plan, then higher contribution rates would be necessary.*

Comparison of Alternative Plans with PERA New Hires						
Targeted Benefit Approach Judicial Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost	Replacement Ratio at Age Target		
				60	62	65
Current PERA Hybrid Plan	7.29%	8.00%	100%	51.7%	65.0%	75.0%
Defined Benefit and Defined Contribution Side by Side Plan	9.17%	9.50%	122%	52.6%	63.6%	75.0%
Cash Balance Plan	8.93%	8.00%	110%	54.8%	62.2%	75.0%
Self-Directed Defined Contribution Plan	15.09%	8.00%	150%	54.2%	61.8%	75.0%
Defined Benefit and Social Security	16.41%	6.20%	147%	34.5% <sup>1</sup>	63.3%	75.0%
Defined Contribution and Social Security	13.58%	14.05%	179%	35.2% <sup>1</sup>	60.4%	75.0%

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> Does not include Social Security benefits since not eligible at age 60.

The blue cylinders in the following figure are the same height, which means the benefits are at the same level for each of the plans. The higher red cylinders show that for the same benefits as the current PERA Hybrid Plan, costs will increase in the alternative plans.



Source: Gabriel, Roeder, Smith & Company.

## TARGETED CONTRIBUTION APPROACH –Judicial Division-Summary of Findings

*The study finds that the existing PERA Hybrid Plan provides a higher level of benefits at the current cost than all alternative plans. Therefore, if the State desires to keep the costs the same under an alternative plan, then benefits would need to be reduced.*

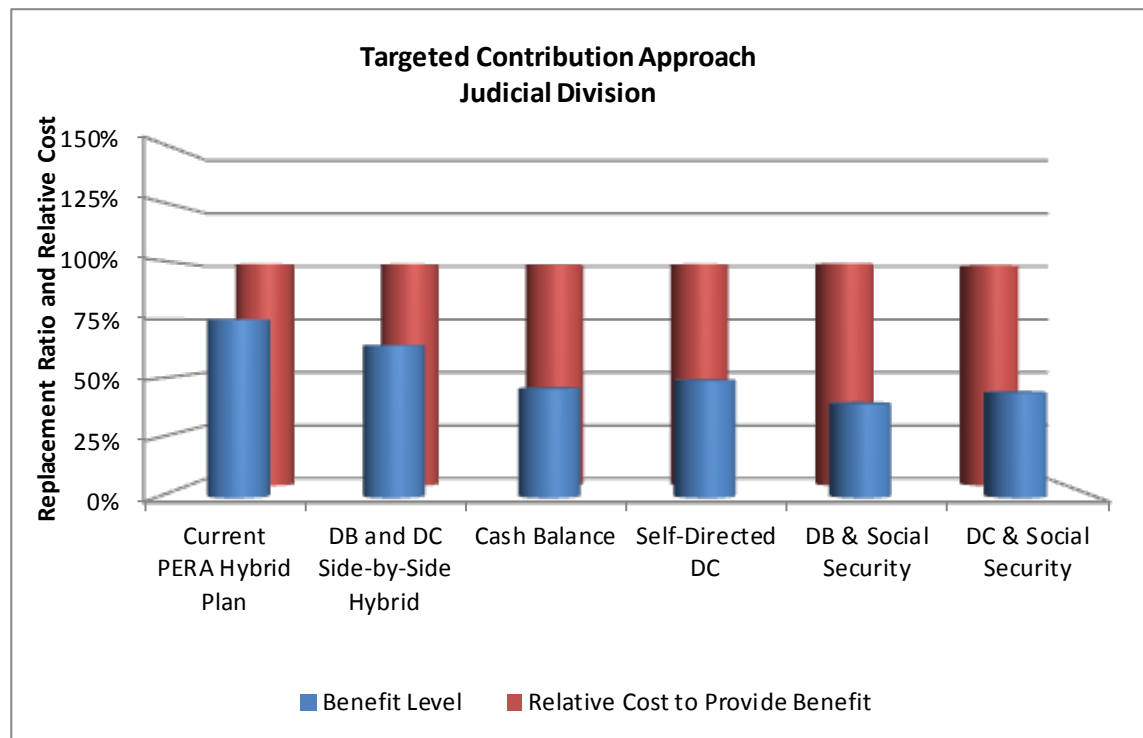
Comparison of Alternative Plans with PERA New Hires						
Targeted Contribution Approach Judicial Division						
Illustrated Structure	Employer Contribution	Member Contribution	Relative Cost Target	Replacement Ratio at Age		
				60	62	65
Current PERA Hybrid Plan	7.29%	8.00%	100%	51.7%	65.0%	75.0%
Defined Benefit and Defined Contribution Side by Side Plan	9.17%	6.12%	100%	44.7%	54.6%	64.0%
Cash Balance Plan	7.29%	8.00%	100%	33.5%	38.0%	45.8%
Self-Directed Defined Contribution Plan	7.29%	8.00%	100%	35.5%	40.5%	49.2%
Defined Benefit and Social Security	9.09%	6.20%	100%	9.9% <sup>1</sup>	32.3%	39.4%
Defined Contribution and Social Security	9.09%	6.20%	100%	6.7% <sup>1</sup>	27.6%	34.5%

Source: Gabriel, Roeder, Smith & Company.

<sup>1</sup> Does not include Social Security benefits since not eligible at age 60.

The red cylinders in the following figure are the same height, which means the costs are at the same level for each of the plans. The lower blue cylinders show that for the same costs as the current PERA Hybrid Plan, benefits must be reduced in the alternative plans.





Source: Gabriel, Roeder, Smith & Company.